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FIRST PART.

ORIGINAL ARTICLES

The Present State of Agricultural Education in Austria

by

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In Austria, or rather in the countries represented in the Austrian iament (Cisleithania), agricultural education is imparted in technical cultural schools and by travelling lecturers. These two forms of tuition not sharply distinguished from each other, for often the teaching staff he schools act as travelling lecturers, while some of the latter hold ses which resemble those given in the schools, differing from them only eing of shorter duration.

A. — TECHNICAL AGRICULTURAL SCHOOLS.

These schools date back to the eighteenth century. The first of them were ted on the initiative of private persons, some of whom were large land- ers who had recognized the necessity of technical agricultural instruction. h the development of agricultural cooperation, the cooperatives (even e of the smaller ones) founded schools of agriculture. Especially r the sixties, this movement became very active and most of the agri- ural schools in Austria owe their origin to private initiative, chiefly t of agricultural associations.

At first some uncertainty prevailed as to the objects and extent of new schols ; only later, in the seventies, did they begin to differentiate ording to their several aims. As soon as a Ministry for Agriculture was ted in Austria (in 1868) it took an especial interest in agricultural edu- ion. After consultation with the most competent persons and institu- s the Ministry issued a series of decrees with the object of giving a first anization to agricultural education.

To that period is due the present distinction of higher, medium and lower agricultural schools. This sharp distinction distinguishes the Austrian agricultural school system from that of most countries, in only a very few of which this systematic graduation from the highest to the lowest school has been adopted.

1. *Higher agricultural education.* — In Austria those institutes which give the highest scientific instruction in all the branches of agriculture, and which admit only those pupils who possess a good general preparation and the leaving certificate (Mittelschulmatura) of medium schools, are considered as agricultural colleges.

The subjects taught are not only the purely technical ones, but comprise also all those scientific subjects which concur in making up a higher culture. The course has a duration of four years and gives the necessary knowledge for managing large estates and for teaching in colleges and medium schools as well as for scientific research work in agriculture; it also enables students of other professions to gain useful knowledge concerning the cultivation of the soil. At the end of the course there are three State examinations (Staatsprüfungen) to be passed. Besides this the students may obtain the academical degree of doctor in agriculture (Doktor der Bodenkultur) on presenting a thesis and submitting to severe examinations.

At present the following colleges exist in Austria :

1. Vienna (Hochschule für Bodenkultur), consisting of three sections, agriculture, forestry and rural engineering ; tuition is imparted in German.

2. Krakau, the agricultural section of the University of Krakau, in which teaching is in Polish.

3. Prague, at the Bohemian University, in which Czech is the language used.

All these three colleges are under the Ministry of Instruction.

Besides these completely equipped colleges there are also agriculture chairs at the following technical colleges: Vienna (German), Graz (German), Prague (German and Bohemian), Brünn (German and Bohemian) and Lemberg (Polish). The object of these chairs is to complete the instruction of the students of the technical colleges, especially of the engineering section.

2. *Agricultural Academies.* — At first, besides the higher education in agriculture, there were only the medium and lower schools. Towards the end of last century an intermediate school has been introduced between the higher and the medium schools ; it is called the agricultural academy and imparts instruction as in the colleges, from which it differs in that the course lasts two years, or if desired three years, instead of four. The academy admits pupils from the medium schools of general culture and also from agricultural medium schools.

There are at the present time three agricultural academies, which are regional institutions, and like all the following agricultural schools are under the control of the Ministry of Agriculture.

While the Colleges do not possess any farm attached to them, or only an experimental one, the agricultural academies have large farms for exp

tal and educational purposes, and they give their students the theor-
l and practical knowledge required for the management of large estates.

3. *Medium Agricultural Education.* — The students who have been
ugh the agricultural medium schools are also capable of managing
: and moderate-sized estates, and they can, as well as those from the
lemies, on conforming to the regulations, become teachers in the lower
:ultural schools. These medium agricultural schools are open to all who
: passed the lower four classes of a middle school for general culture or
he classes of a secondary school (Bürgerschule).

Instruction in these schools is chiefly theoretical, but where possible
tical tuition is also given, as almost all of them dispose of a completely
pped school farm. Students who have obtained their diploma may,
n passing an examination before a commission in the presence of a
ernment official, be admitted as one-year volunteers in the army.

There are at present in Austria nine medium agricultural schools; in
of these German is spoken, in four Bohemian and in one Polish. With
one exception they are regional institutions. There are, besides, two
ial schools, one of which is the Klosterneuburg higher school for vine and
t growing, which is a State institution, and the other the horticultural
ol at Eisgrub, a private institution, but subventioned by the State
officially recognized.

4. *Elementary Agricultural Education.* — The number of lower agricul-
l schools is much greater than that of the above-mentioned schools.
ir object is the spread of agricultural knowledge among the peasant popu-
n. At first there were only elementary agricultural schools for boys.
er such were opened also for girls.

In some schools for boys the course is a two-years one (Ackerbauschule),
thers its duration is only of one or two winter half-years (Winterschulen).
The first are the oldest, and they receive pupils who possess the general
cation that is given in the primary shools (Volksschulen); theoretical
practical instruction (the latter on the school farm) are given. The ob-
of these schools is to form a class of better educated peasants and also
rseers and foremen for large estates.

The number of these schools is forty-two, of which thirteen are German,
rteen Bohemian, seven Polish, two Slovenian, two Italian and four
ngual.

The number of agricultural winter schools is constantly increasing, and
ng the schools for the peasantry they have proved to be the best. As
e winter schools are open only during the five or six months of the worst
on and as but few of them possess a school farm, the instruction given is
tly theoretical and includes subjects of general education as well as agri-
ure. The commencement of the courses is regulated according to the
atic conditions of the locality. In most of the winter schools a second
ler course follows the first, so that in reality the course covers ten to twelve
nths.

In general such good results have been obtained with the two-course
ler schools that at present the tendency is to found two-course winter

schools and to convert into such the one-course schools. For admittance them the pupils must possess the elementary knowledge given by primary schools. The pupils work during the summer, between the two courses, on their fathers' farms; with the present scarcity of rural labour this is a great advantage. After having frequented these schools they generally remain on their parents' farm, in the improvement of which they use the acquired knowledge, and at the same time set an example to their neighbours.

In 1913 there were 91 winter schools ; some are regional, others association or private institutions. There are, besides, some schools which are similarly organized, but which devote themselves to some special branch such as vine-growing or market gardening.

Such special branches are also treated in some lower schools in a one years' course lasting ten or twelve months or less. Their object is to improve pupils in market gardening, fruit or vine growing, in the cultivation of hops or meadows, and in dairying or other special branches of agriculture consequently they have been founded where these particular forms of farming are prevalent. Their number is now 24.

5. *Agricultural Instruction for Girls.* — In the nineties the opinion began to gain grouhd that instruction limited only to boys was not sufficient because in farming in general, and especially in some branches, the influence of the women in the family is very great. Thus the necessity of providing technical instruction for women also was recognized and the first housekeeping schools were founded with the object of teaching farmers' daughters the domestic management of a farm house, together with some notions of agriculture. These schools are not all of them organized on the same lines. There is one housekeeping school which bears the title of agricultural school for girls. In order to be admitted to it a fairly good preparation is demanded, such as is given by the secondary schools (Bürgerschule) or training schools for teachers or high schools. Besides housekeeping it teaches agriculture systematically, the curriculum being about the same as in the practical schools of agriculture (Ackerbauschulen), so that the girls on leaving the school are not only qualified to manage a large farm household, but can also act as assistants on a farm or teach in agricultural housekeeping schools.

The other agricultural housekeeping schools, which demand as preparation for admission only the knowledge acquired in the elementary schools, are divided into those whose course extends over a whole year and those to which it is limited to five or six months.

Besides the above, there are also the so-called summer housekeeping schools attached to the agricultural winter schools. They have the same objects in view as the housekeeping schools and a similar curriculum, but they differ chiefly in the shorter duration of instruction (three to five months) as well as in the time of year during which they are open, generally from April 1.

The most important data on the agricultural schools as they were during the scholastic year 1912-13 are the following:

Institutions for Agricultural Education in Austria.

Institutions	State	Regional	District or association	Private	Total	Staff		Number of students	Scholarships	
						Permanent	Assistants		Number	Yearly amount
										£
es and Sections of Universities	3	—	—	—	3	[1] 92	[1] 58	[1] 1 631	147	[1] 2 774
mies	—	3	—	—	3	52	19	342	64	[2] 1 606
m schools	1	8	1	1	11	97	60	1 274	103	1 172
ntary schools	1	26	13	1	41	169	186	1 486	484	4 530
winter schools	—	55	33	3	91	251	610	3 370	921	2 753
special schools	—	19	14	1	34	110	99	868	240	1 794
housekeeping schools, h 2 years' course	—	—	—	1	1	6	8	22	—	—
housekeeping schools	—	4	13	5	22	100	63	630	44	[3] 277
Total	5	115	74	12	206	785	1 045	7 992	1 856	12 132

(1) In the expenses of the colleges those of the forest section and of the rural engineering sections Vienna agricultural school are included; for this reason these expenses are not comprised in tal.
(2) Including 12 free places.
(3) In the last budget only two extraordinary grants of £ 96 are included.

– TRAVELLING AGRICULTURAL LECTURESHIPS AND SPECIAL COURSES.

regular agricultural school education is, under present conditions, ible for only a limited number of intending farmers. Consequently ought to use other methods besides schools to promote the spread of ltural instruction. These methods are travelling lectureships and l courses. The lectures are given either by travelling lecturers specially nted for the purpose or by some of the teachers of agricultural ls, both classes of lecturers visiting in turn the various localities of a ct.

While the travelling lecturers in the southern districts, such as Dalmatia llyria, which are less developed from an agricultural point of view, are inted by the State, in all the other parts of the Empire they are officials e independent local authorities or of the principal agricultural corpora- and associations; nevertheless the State contributes in most cases eir salaries.

For all the crown lands, regulations have been drawn up for the carry out of this service.

As the effect of a lecture is in general but slight, the lecturer is bound the regulation to keep himself posted in the progress of his territory, to k in touch with the rural populations and to assist the people with advice action in any difficulty connected with farming.

Among the duties of the lecturer there is also the holding of cours which may last a day or more, in order to instruct farmers, anxious to lea in certain branches of agriculture, such as dairying, live stock keeping, po try keeping, fruit tree grafting, forage growing, etc. Such courses are oft held by teachers of the winter or other agricultural schools during th free time, either in the same schools or elsewhere, and contribute efficien to the spread of modern farming methods. These courses are not limited the men and boys only, but extended under the form of lectures on cook and domestic economy to the women also.

All the members of the teaching staff, whether travelling or otherw must before being definitely appointed pass an examination as to aptit for teaching. This examination is held at one of the colleges in Vienn in Prague, and is divided into an examination for medium schools and for lower schools. There are, besides, examinations for fruit and vine g ing and for agricultural housekeeping schools. For these examinations t are special regulations drawn up by the Ministries for Education and Agriculture.

As agricultural instruction in Austria is not all under one single con but is managed partly by the State and partly by other bodies, such as governments, district municipalities, associations and even by private sons, it is not easy to ascertain the amounts of the sums spent for this ob Nevertheless, from the following data concerning the expenses and cont tions of the State, which form only a small part of the whole, some id the outlay may be formed.

The budget for 1913 contains the following figures:

1. In the budget of the Ministry of Instruction, under whose con all the Universities and Colleges are situated, consequently also the a cultural sections of the Vienna College, of the Czech Polytechnic of Pra and of the University of Krakau, the allotments for agricultural instruc are not given separately, but only the lump sums for each institut Nevertheless these figures show the amount of the contribution of State for this branch of education.

In the budget for 1913 the estimates for the Vienna College are set d at £. 28356, of which about one half may be considered as devoted to agricultural section. There is besides a special credit of £. 1742 provi Higher agricultural education shares also for an amount which is not st in the sums voted for the Czech Polytechnic of Prague, *viz* £. 57078 ordi expenses, and £. 18892 extraordinary ones, and in those of the Kr faculty of philosophy, namely £. 31 450 Of these sums between one-fo and one-third may be safely reckoned as being spent upon agricul education. It is also to be noted that the cost of the chairs of agricu

the Polytechnic schools of Vienna, Gratz, Prague, Brünn and Lemberg also to be included in the sums spent on higher agricultural education.

2. In the budget estimates of the Ministry of Agriculture, upon which the other schools of agriculture depend, the following figures are included:

1) For the State Institutes of Klosterneuburg, Spalato and Glavica, ordinary expenses	£	10 046
Extraordinary do	»	83
Total	£	10 129
2) For grants to agricultural schools not belonging to the State, as well as for travelling lectureships and special courses, ordinary expenses	£	28 750
Extraordinary do.	»	15 000
Total	£	43 750
3) For the spread of means for agricultural instruction, for scholarships, subventions, travelling expenses, expenses for State inspectors of subventioned schools, for the commissions of examiners of teachers of agriculture and forestry, ordinary expenses	£	8 333
4) For travelling lecturers and special courses, which are partly (in Dalmatia and Illyria) instituted by the State and to a greater extent by the local Governments and by the principal agricultural associations, further for the cost of agricultural instruction to soldiers and for the upkeep of model farms, ordinary expenses	£	15 417
Extraordinary do.	»	4 167
Total	£	19 584

According to the above the total outlay of the State for agricultural education, excepting college education, is:

1) For State Institutions	£	10 129
2) For subsidizing institutions not belonging to the State	»	43 750
3) For general agricultural education	»	8 333
4) For travelling lectures and special courses	»	19 583
Total	£	81 795

From these figures it may be seen that the State takes a special interest in agricultural education; by comparing them with those of the previous years it will be seen how rapidly the outlay for this object has increased. This increase is explained not only by the increased number of institutions (as for instance, in 1912, eight new ones have been opened), but also by the greater demands of efficiency made upon them.

Recent Work of the Bacteriological Section of the Central Agricultural Experiment Station at Experimentalfället, near Stockholm

by

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Chief of the Section.

The Bacteriological Section undertakes research and experiments agricultural microbiology in general. This work includes the bacteriol of the soil, of manure and of dairy produce; the subjects are often treat in conjunction with other sections of the Institute.

The work on soil microbiology has been concerned with methods investigation, and more recently with the influence of organic substan on nitrification and denitrification in the soil. Just now, the decomposit of farmyard manure in the soil, both alone and in presence of lime, is oc pying attention. The changes of a biological nature induced in the soil farmyard manure have so far been insufficiently explained.

In colloboration with the Botanical and Agricultural Sections, num ous trials have been made with different cultures of Leguminous-nod organisms, such as Bottomley's "Nitrobacterin", Simon's "Azotoger and cultures prepared by us. "Nitrobacterin" contained no living *radicicola*, and consequently produced no effect; "Azotogen" gave v good results and the results of experiments with the cultures prepared our own laboratory were likewise satisfactory.

On the subject of the fermentation of farmyard manure, work been undertaken in collaboration with the Agricultural Experiment Sect on the possibility of preserving the ammoniacal nitrogen of the manure the addition to it of whey from cheese-factories. Some years ago I fo that the common lactic ferments occurred in great numbers in farmy manure; by supplying them with carbohydrate material, such as sugar, one ought to get a fermentation in which the acids produced fix ammonia of the manure, thus preventing the usual loss of nitrogen in form. Chemical and bacteriological analyses, as well as field trials car out by the Agricultural Section of the Institute, have shown that this tr ment of manure (0.25 and 0.5 per cent. of milk sugar being added) has expected effect, and the manure gives considerable increase of crops manure kept in the ordinary way.

Bacteriological work on dairy questions has also taken up a good of time.

Firstly, a satisfactory method for judging the quality of dairy from the hygienic standpoint was sought for. The reductase test was fo

swer the requirements in this case. It is very easy to carry out and
a very fair approximation of the number of micro-organisms present
ilk. The result has been that the method has spread widely, both in
n and in other dairy countries. In the Swedish dairies, where the
of milk is now beginning to be fixed on its hygienic qualities, as well
fat-content, the reductase test is used as the basis for the former.
ther work was dealt with: anaerobic organisms of milk and butter;
nce to heating of tubercle bacilli in whey (in view of a projected mea-
n compulsory pasteurization of waste dairy products); biology of the
bacilli, especially with regard to the part they play in the ripening
eses; influence of different methods of pasteurization on the micro-
of milk; bacteria of slimy milk.
hese researches are often not confined to the bacteriological laboratory,
e also made in various dairies, so as to bring them under the condi-
of practice.
esides this work, of which the results have been published in the Bul-
of the Central Institute, as well as in various scientific journals in
countries, a great number of bacteriological analyses have been made
f charge on samples of milk, butter, cheese, water used in dairies,
etc., sent in by private persons. Consultations on questions of agri-
al microbiology are also given free.

Organization of Field Experiments in Denmark

by

H. C. LARSEN,

Secretary of the State Commission for Field Crops at Copenhagen.

Experiments on crops have been carried on in Denmark since the
lle of the nineteenth century. When the *Royal Agricultural and Veteri-
College* ("Den Kgl. Veterinaer og Landbohøjskole") was founded about
time, 25 acres of the land belonging to it were set apart as an experi-
al field; on this experiments were begun on a plan similar to that of
Rothamsted Experimental Station. These experiments went on for
than thirty years. From 1882 to 1903, a Commission nominated by
Royal Agricultural Society ("Det Kgl. Danske Landhusholdningssel-
") carried on extensive experiments on cereals, particularly wheat
barley; these were made in various parts of the country and were aimed
ermining: the varieties best suited to the climatic conditions of the
ry, best date for sowing, amount of seed, time of harvest, method
rvesting, etc. In 1894 *Local Agricultural Societies* began experiments
e land of their members, practical farmers; this work has extended so
that each year more than 2000 experiments are made, under the
ices of about 120 societies in all parts of the country. The results of

these experiments are generally only of local value, and indeed are o
only applicable to the field in question; in the earlier years they
mostly concerned with the use of chemical manures and the manu
requirements of the soils; later they were extended to almost all point
field practice. By statistical elaboration of the mass of material for
year's experiments, the results have been made useful in various branc
of agriculture in a way that was not previously possible.

The *Government crop experiments* ("Statens Forsøgsvirksomhed i Pla
kultur") were begun after 1870 by P. NIELSEN, State consulting specia
under the auspices of our Royal Agricultural Society. They are essenti
based on *fixed field experiments*, whose results, separately or combi
can be considered of value for the whole country, or at any rate
large areas. This branch was made into an independent State institu
in 1886 by the establishment of an experimetal station at Tystofte.

The following *permanent Government crop experiment stations* now ex

1. *Tylstrup*, in northern Jutland (Vendsyssel); established in 1
area — 91 acres of sandy soil, 91 acres of fen (*Carex* moor), 128 acr
peatmoor (*Sphagnum* moor).

2. *Studsgaard*, in central Jutland; established in 1906; area —
acres of light sandy soil ("grass heath"), 37 acres of sandy soil at B
(western Jutland), 27 acres of fen, 54 acres of peatmoor near Hem

3. *Askov*, in southern Jutland; established in 1886; area — 57
of clay, 17 acres of sandy soil, 15 acres of peatmoor.

4. *Aarslev*, in Fünen; established in 1905; area — 82 acres of

5. *Lyngby*, in north-east Zealand; established in 1890; area —
acres of clay.

6. *Tystofte*, in south-west Zealand; established in 1886; area —
acres of clay.

The *sub-stations* are as follows: *Abed*, in Laaland (5 acres of good c
and *Aakirkeby*, in the island of Bornholm (7 ½ acres of heavy clay).

Temporary experiments, made on a fairly large scale, comprise: gro
of root crops, diseases of plants and their control.

With these experiments are combined chemical, botanical and b
riological researches, carried out in the *State Field-crop Laboratory* ("
teas Planteavlslaboratorium") at Copenhagen, as well as in the *che
laboratories* of the permanent stations.

The *Danish Seed Control* ("Statsanstalten Frøkontrol") was
lished by the State in 1871; this institution assists in the experiment
by controlling the seed used in the trials.

In the *State experiments*, the method to be followed is fixed esp
with regard to the *position of the stations* and the nature of their la
mentioned above, three of the six permanent stations are in Jutlan
three in the large islands, while the smaller islands have two sub-st
The country is thus divided into naturally bounded districts, in
the soil and climate are in agreement with those of the station; i
district the land for the experiments has been chosen to have soils as
as possible for the regions under consideration (clay or sand, fen or

s the results of the experiments carried out at each station depend essen-
ally on the soil and climate, this method guarantees them the greatest
ssible value for the agriculture of the district; and as they are, owing
their nature, carried out simultaneously at several or all of the stations,
e conclusions drawn from them rest on as wide and solid a base as possible.
his is particularly important in comparative trials with different varieties
crops and in experiments on seed yield, time and method of sowing, cul-
vation, rotations, etc.

Before a piece of land is selected for experiments, the conditions and even-
ss of the soil are very carefully gone into; uniformity is an indispensable
ondition of land for experiments. Numerous samples of soil and subsoil
e taken according to a pre-arranged plan and at definite distances apart;
ese are judged and submitted to physical and chemical examination.
hen the experimental ground has been chosen, the whole is given a trial
ltivation by the same methods and under the same crop, generally for
veral years, so as to work out any possible irregularities due to previous
pping; the soil is thus made uniform. At the same time, the uniformity
tested by weighing the produce of plots not larger than those which will
entually be laid down. The large amount of material obtained from these
eliminary investigations allows a very exact estimation of the evenness
the land to be obtained, and serves for the arrangement of the experi-
nts, the classification of the soils, and the setting-out of the fields and plots
the different experiments. The management of the plots is also arranged
that any differences due to the experiments themselves are equalized
fore fresh experiments are started.

In Denmark, as elsewhere, the disturbing influence of variations in
tility is further guarded against by arranging a large number of parallel
ts, arranged in size, shape and position in such a way that their average
tility may be supposed to be the same as that of the whole field. The
mber of parallel plots is generally from 6 to 12; for manuring experiments
ey cover 4 to 2 rods ($^1/_{40}$ to $^1/_{80}$ acre); for trials of various seeds and crops,
rods to 12 sq. yds. ($^1/_{80}$ to $^1/_{400}$ acre); for pasture plants, 1 rod to 6 sq.
s. ($^1/_{160}$ to $^1/_{800}$ acre). The smaller the resulting figures from an ex-
riment, and the less the evenness of the land, the greater must be the
mber of parallel plots. With variety-trials the number often reaches
, and sometimes exceeds 20 (1). The influence of two adjacent plots on
e another may be avoided by establishing a sort of protecting belt all
und the plot, and weighing only the produce from the part thus enclosed.

The exactness of working may be examined and checked by a calcu-

(1) In working with different varieties of cereals, the seed samples are all taken from
e same spot and under similar conditions. In root crops, especially in comparing varieties,
e percentage of dry matter is considered as of prime importance; to determine this four
erage samples are taken from each parallel plot for each variety, each sample consisting
at least fifty roots; all these roots are cut across four or five times to get a pulp for
alysis. The dry matter is calculated from the mean of the four analyses.

lation of the probable error on the materials used, and this can be made as well while the experiments are in progress as when it comes to working up the results for publication. But nothing is published till the results admit of no possible doubt. The experiments are carried on for at least five years, and often for a much longer period before the results are considered fit for publication. Experiments on manuring for rotations thus last over two or three courses, making 16 to 24 years. In this way the influence of the different seasons is largely eliminated, in most cases a necessary condition for obtaining reliable results.

The organization and direction of the State activity as regards experiments is under the control of the Ministry of Agriculture. The *permanent Experiment Stations* are organized as ordinary farms as far as the experimental work permits. Each station is under a *director of experiments*; further, two such directors have charge of the temporary experiments. The directors engage the staff and are nominated and dismissed by the Minister of Agriculture on the advice of the *State Commission for Field Crops* ("Statens Planteavlsudvalg"). This Commission acts as intermediary between the Minister and the State activity on field crops; it sits at Copenhagen and is composed of three members nominated respectively (subject to the approval of the Minister) by the Royal Agricultural Society (whose delegate acts as Chairman), by the governors of the Royal Agricultural and Veterinary College and by the Agricultural Societies which cooperate in the work.

The Budget fixes every year a detailed *plan of work* for the State experimental activity, with details for carrying out the experiments and researches proposed; these number over 200 each year. The directors of experiments discuss the experiments to be made with the representatives of the local experimental organization and also with those of other institutions which collaborate in the work; they then together make up a plan of work which is sanctioned by the State Commission after joint discussion and possible revision; after this the directors are solely responsible for carrying them out. A copy of the results is sent in each year to the archives of the Commission and is used for the working out of the results. The directors themselves undertake this work; for each series of experiments a *reporter* is nominated; when the series is finished he balances the results and draws up his report. This report is agreed to by all the directors and then published by the State Commission in the *Annals of the Production of Field Crops*; this is the organ of the experimental activity, and is edited by the secretary of the State Commission. *Summarized popular reports*, drawn up in the same way, are published as special leaflets and in the newspapers to bring the results of the experiments before farmers; they are distributed free in large numbers in railway stations and agricultural schools, and meetings, shows, etc. These summaries are also published in the *Ann*

h also give reports and extracts of reports on the local experimental
, control of Danish seeds, etc. (1).
The *organization and direction of the local experimental activity* is under-
n by the local Agricultural Societies or their federations. The plans
elaborated and directed by *Local Crop Commissions* and are carried out
he consulting specialists named by them, or at any rate with the assist-
of these. The different Local Commissions in each Province work
ther, holding a joint meeting once a year; at this meeting a complete
rt on the results of the experiments made in the province is presented,
the problems and plans for the experiments of the coming year are
ssed. The four Provinces of Jutland, Fünen, Zealand and Laaland-
ter, each have also a Crop Commission nominated by the societies
erating in the work, with a consulting specialist for the subject.
e *Provincial Crop Commissions* direct the joint work of the Local
missions, collect and publish their reports, and through their consult-
pecialists organize and direct the experiments and researches of special
est for the province or the country in general. In the case of experi-
ts of general interest the matter is discussed at the annual meetings
e Provincial Commissions and between these and the State Crop Com-
ion, the State directors of experiments, etc.
The *annual State grants* are as follows: for the State experimental
ity, about 200 000 crowns (£11 000); for the local experimental activity,
t 100 000 crowns (£5 500). The latter is allotted on condition that the
ties themselves contribute more than one-half of the total expenses of
experiments.

The Possibility of Replacing Stassfurt Potash Salts by Finely Ground Phonolite Leucite, etc.

by

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nand of the Experiment Station of Agricultural Chemistry for the Province of Brandenburg.*

CONSUMPTION AND EXPORTATION OF STASSFURT POTASH SALTS.

Before examining the question of the possibility of replacing the Stass-
otash salts by other minerals it is necessary to know what quantities
se salts are produced and consumed.

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1) Subscriptions for the *Annals* may be sent to the "Gyldendalske Boghandel", Co-
en; the price for one volume (yearly) is 6 crowns (6s 7d).

The total production of potash salts (crude) in Germany was (1):

In 1910	8 031 838	tons
In 1911	9 553 144	»

The manufacture of concentrated salts from the crude material du the same years and in the same country was as follows (2):

Year	Chloride of potash	Sulphate of potash	Sulph. of potash and magnesia calcinated 48 %	Potash salts for manure	Sulph. of potash and magnesia 40 %	Kieserit in blocks	Calcin gran Kies
	tons	tons	tons	tons	tons	tons	t
1910	427 382	91 735	40 873	516 581	105	29 382	7
1911	436 352	108 383	48 239	635 522	141	29 700	7

The quantities used in Germany for agricultural purposes were following (2):

Year	Crude salts	Containing pure potash	Manufactured products	Containing pure potash	Total	
					Salts	Pot
	tons	tons	tons	tons	tons	to
1910	1 923 623	249 646	261 176	104 012	2 184 800	353 6
1911	2 168 335	285 294	324 739	130 374	2 493 074	415 6

The quantities of crude salts exported amounted to (2):

In 1910	1.16	million tons
In 1911	1.13	

The greatest quantity (709 600 tons in 1910 and 631 900 tons in was exported to the United States. Next in importance are the Nethe with 140 700 tons, followed by Russia with 67 000 tons.

(1) According to Dr. M. HOFFMANN: *Arbeiten der Deutschen Landwirtschafts Gesa* 1910, Part 216.

(2) According to Dr. Hoffmann: *loc. cit.*

he quantities of chloride of potash exported were (1):

In 1910	266 000	tons
In 1911	325 000	"

he chief importing countries were:

	In 1910	In 1911
United States	177 000	219 500
France	34 400	39 100
England	14 600	13 900
Spain	8 600	11 700

he exports of sulphate of potash were (2):

In 1910	74 800	tons
In 1911	108 000	"

he following quantities were shipped:

	In 1910 — tons	In 1911 — tons
To the United States	39 070	56 100
" France	8 560	14 860
" Spain	3 250	5 610
" Ceylon	2 230	3 710
" Japan	414	1 480
" Algiers	1 052	1 820

ie amounts of sulphate of potash and magnesia exported in 1911 2) 278 500 tons, of which 140 700 tons went to North America, tons to the Netherlands and 31 500 tons to Sweden.

ie table on the next page shows the quantities of potash consumed whole world (3):

om the above statistics it will be seen that very considerable quanti- Stassfurt salts are used and that their consumption is on the increase. sides the so-called Stassfurt salts which contain potash in a soluble KCl or K_2SO_4) and which hitherto have been found and worked in quantities only in Germany, other minerals containing potash are th in considerable masses in other parts of the globe. Such are silicates containing potash: phonolite, leucite, sanidine, muskovite, ase, etc. For a long time past attempts have been made to use these ls as manures.

According to Dr. GROSSMANN. Die Ernährung der Pflanze. — *Illustr. Halbmonatsschrift* II (1912), No. 6.

According to Grossmann, *loc. cit.*

According to Dr. Hoffmann, *loc. cit.*

Country	Total potash in tons	Consumptio in lbs. per a
1. Germany	353 835	9.12
2. United States	241 351	1.30
3. Belgium	8 845	4.24
4. Holland	28 934	12.89
5. France	22 482	0.61
6. England	9 778	1.29
7. Scotland	5 804	3.56
8. Ireland	2 754	1.15
9. Austria	11 628	0.73
10. Hungary	1 321	0.06
11. Switzerland	2 733	1.10
12. Italy	5 512	0.30
13. Russia	14 318	0.10
14. Spain	7 232	0.29
15. Portugal	778	0.15
16. Sweden	16 364	4.24
17. Norway	1 733	2.74
18. Denmark	4 298	1.52
19. Finland	966	0.78
20. Other countries	14 282	—

Value of Phonolite as Manure.

Of late especially, efforts have been directed towards the introdu of phonolite into agricultural use, for it was believed that it could compete the so-called Stassfurt salts; as quite recently many experiments have conducted to ascertain the foundation for the above belief it is now pos to give an opinion based on facts as to the real value of this min Phonolite is a leucitophyre and consists chiefly of nosean, sanid nepheline, leucite, augite and biotite. It contains an average of 9 to 10 cent. of total potassium (of which 33 per cent. is soluble in hydroch

id, while only traces are soluble in water), 6 to 8 per cent. of sodium, 2 to 3 r cent. of lime and magnesia, 25 per cent. of oxide of iron and alumina d 50 per cent. of silica.

When phonolite meal was placed on the market, a number of papers re published, especially by WEIN, with the object of demonstrating the od effects of phonolite. As the cause of their useful action, said to be ual to that of the Stassfurt salts, the easy weathering of the stone was ntioned as rendering potash available in sufficient quantities.

But many control experiments carried out by impartial workers ve failed to confirm these favourable results.

When PFEIFFER and his collaborators (1) compared the effects of phono- e with those of sulphate of potash by means of pot experiments in ndy soil, they obtained the following results. The figures refer to the ess of crop over the pots left without potash manures.

					ratio
By 1 gm. of K_2O as K_2SO_4 :	29.49 gms. of oats	± 2.49	100
» 1.087 » » phonolite :	11.82 » » »	± 2.81	40
» 2 » » K_2SO_4 :	40.33 » » »	± 2.84	100
» 2.174 » » phonolite :	19.75 » » »	± 2.29	49

According to the above the utilization of the potash contained in phono- was much inferior to that in the sulphate of potash, being as 9.7 to 88.2. ilar results had been already obtained by other experimenters.

Thus WAGNER (2), in pot experiments comparing sulphate of potash l phonolite for rye-grass, found the following quantities of excess crop r the controls without potash :

	On sandy soil	ratio	On peaty soil	ratio
By 2.5 gm K_2O as K_2SO_4 :	21.9 gm.	100	73.2	100
» 2.5 » » phonolite:	10.1 »	46	24.1	33
» 3 » » K_2SO_4 :	29.3 »	100	85.6	100
» 3 » » phonolite:	8.5 »	29	39.2	46

The utilization of potash was as 100 : 11 on sandy soil and as 100 : 14 peaty soil.

SCHNEIDEWIND (3) also found throughout a considerably smaller effect phonolite in comparison with chloride of potash. The ratio of the

(1) PFEIFFER, BLANCK and FLÜGEL : Die Bedeutung des Phonoliths als Dungemittel. *Mitt. Landw. Instit. Breslau*, Vol. VI, Part 2, 1911.

(2) *Deutsche Landw. Presse*, p. 1, 1909.

(3) Versuche über die Wirkung des Kainits 40%iger Kalisalze und Phonolite. — *Arbeiten Deutschen Landwirtschafts Gesellschaft*, 1911, Part 193.

effects of equal quantities of potash given under the forms of chloride o potash and of phonolite were as follows :

	Chloride of potash	Phonolite
Potatoes	100	33.9
Spring wheat	100	34
Mixed clover and grasses	100	20.3

The utilization of the potash contained in the two manures was th following :

	Chloride of potash	Phonolite
Potatoes	100	24.7
Spring wheat	100	4.1
Mixed clover and grasses	100	10.8

Experiments on vegetation carried out by HEINRICH and HONCAM showed that the effects of equal quantities of potash under the form 40 per cent. potash salts and of phonolite were respectively as follows :

	40 % salt	Phonolite
Barley (grain)	100	36
» (straw)	100	36
Peas (grain)	100	31
» (straw)	100	42

The utilization of the potash in the phonolite was with barley 14 cent. and with peas 20 per cent. of that of the 40 per cent. potash salt. these careful experiments show that the potash contained in phonolite undoubtedly a certain action, but that this is notably inferior to t exerted by easily soluble potash salts.

The results obtained by the easily soluble potash salts, contrary to statements of interested parties, are not attained when phonolite is not mi with the soil but given as a top dressing, as, for instance, was done in Pfeiff experiments. As for the other available trustworthy experiments they not offer data differing to any extent from the preceding ones.

In the open field phonolite does not in any way have the same effect the Stassfurt salts. This is clearly shown by the experiments made SCHNEIDEWIND (*Arbeiten der Deutschen Landwirtschafts-Gesellschaft*, 1 Part 193), TACKE (*Protokoll der* 64 *Sitzung der Zentralmoorkommission* 1 and *Illustr. Landw. Zeitung* 1910, No. 3), v. FEILITZEN (*Mitt. der Deutsc Landw. Gesellschaft*, 1910, page 145), HILTNER and LANG (*Prakt. Bl f. Pflanzenbau*, 1909, Parts 10 and 11), POPP (*Mitt. der Deutschen Lan Ges.*, 1909, p. 724), etc. Thus for instance Hiltner and Lang determi that the effect of equal quantities of potash given to oats under the fo

(1) Vergleichende Untersuchungen über die Düngerwirkung von 40 %igem Kalisalz K silicat, etc. — *Mitt. der Deutschen Landw. Ges*, 1910, No. 45.

per cent. potash salts and of phonolite stood in the ratio of 100 : 22 (according to the other fertilizers applied at the same time); when to potatoes the ratio was 100 : 8 to 30 (according to the other izers used at the same time).

Popp found that in an average of three years the effect of Stassfurt stood to those of phonolite as 100 : 26 to 31, and in another experi- lasting four years as 100 : 26 to 28.

It was thus demonstrated that in the open field, as in pots, the utiliza- of potash when given as phonolite was considerably less than when as Stassfurt salts.

TACKE'S field experiments showed that potatoes on sandy soil utilized per cent. of the potash of 40 per cent. potash salts, and only 1.2 per of that of phonolite (ratio 100 : 4.5); he showed further that with moor on moor soil the ratio of utilization was as 100 : 22 and that with oes on moor soil it was as 100 : 24.

In some isolated cases (observed by Popp) the effect of the potash in olite was found to be equal, and even superior, to that of the potash in furt salts. But these results, as well as their opposite in which pho- e either exerted no action at all or was positively injurious, have no ficance; they are in the most favourable cases quite exceptional and most ably due to chance caused by the imperfection of field manuring riments.

The conclusion drawn from both pot and field experiments, namely that olite has a certain action but that this is inferior to that of Stassfurt agrees with its petrographic mineralogical composition. One of the chief onents of phonolite, and at the same time the richest in potash, is sani- which is decomposed with difficulty: the potash of this mineral is not ked by hot concentrated hydrochloric acid. Nosean and nepheline ore easily decomposed, but they are poor in potash and rich in soda. ite is more easily decomposed, and weathered than sanidine; thus otash available for plants would appear to derive from leucite and eline, while the chief potash-bearing mineral, that is sanidine, is hardly considered as a source of potash for vegetation.

From this composition of phonolite it can be further concluded that easy weathering attributed to it is due to the minerals nosean and eline, which, however, contain but small quantities of potash. The weathering of phonolite, upon which so much stress is laid, can only very limited extent cause a rapid action of potash.

VALUE OF FELDSPAR AS MANURE.

For a long time past feldspar has been considered as a possible manure. W. KNOP in his treatise of agricultural chemistry (1868) at page 188 that it was not unlikely that some day feldspar would be used as a ferti- It was also believed that its potash was easily assimilable by plants; xperiments carried out with this mineral have shown that the manurial

effect of the potash-containing feldspars is very slight (1), as the follow experiments prove.

HEINRICH and HONCAMP (see foot-note) found that the fertilizing ef of equal quantities of potash given under the forms of 40 per cent. potash of phonolite and of feldspar were as in the following table, in which quantities produced above those of the control plot are given :

	Straw	Ratio	Grain	Ra
1. Barley				
40 per cent. potash salt	348.2	100	343.8	1
Phonolite	136.2	39	124.8	
Feldspar	60.2	17	25.2	
2. Field peas.				
40 per cent. potash salt	204.7	100	94.3	1
Phonolite	85.9	42	29.2	
Feldspar	27.1	13	10.3	

As for the utilization of potash, if that, of the 40 per cent. salt be equal to 100, then the utilization of phonolite by barley was = 14 an field peas = 20 ; while the utilization of feldspar by barley was = 4 an field peas = 7.

This inferior effect of feldspar (orthoclase) compared with th phonolite (leucitophyre) is in harmony with the lower solubility o potash of orthoclase in water containing carbonic acid and in ammo chloride solution as compared with that of the leucitophyre potash; t has been determined by R. MÜLLER, K. GLINKA, H. STREMME (2) others. A series of experiments made under PRIANISHNIKOV's dire

(1) Manuring experiments with feldspar have been conducted, among others, by: C. v. FEILITZEN: *Svenske Moorkultur Förenings Tidskrift*, 1891 (quoted by *Zeitschrift d. Landw. Kammer f. Schlesien*, 1913).

L. F. NILSONS: *Landtbruks Akademiens Handlingar och Tidskrift*, for 1889 (quot Blanck, *loc. cit.*).

J. SEBELIEN: *Tidskrift för det Norske Landbrug* XIII, 1901, p. 69 (quoted by *loc. cit.*).

D. PRIANISHNIKOV: *Landw. Versuchsstation*, Vol. 63, 1906, p. 151; Vol. 77, 1912.

R. HEINRICH and F. HONCAMP: *Mitteilungen der Deutschen Landw. Ges.*, 1901 Parts,

(2) H. STREMME,: Die Verwendung des Leucitophyrs als Kalisilikat. — *Kali, Zt für Gewinnung der Kalisalze*, 1912, Part 7.

w that all the minerals of the feldspar group possess only a very low ash effect, as may be seen from the following figures:

	Without potash	With orthoclase	With microkline	With sanidine	With KCl (normal culture)
. . . . .	5.33	4.56	5.61	4.66	22.96
rch at	1.50	2.40	1.95	1.88	14.95
ics	2.05	2.45	2.65	4.65	13.85

Thus the potash feldspars (orthoclase, sanidine, microkline are the spars richest in potash) can compete with the easily soluble Stassfurt ; still less than the leucitophyres (phonolite).

UE OF FELDSPAR-LIKE MINERALS (LEUCITE, NEPHELINE) AS MANURES.

It is well known that leucite (silicate of potash and alumina) is rel-ely easily weathered. Owing to the circumstance that leucitic rocks found in considerable quantities in Italy, the question of using leucite manurial purposes has been investigated for some years past in that ntry (1). MONACO (2) has used for this purpose the fairly decomposed ; containing leucite, of Orchi on the volcano of Roccamonfina, ; he mined its solubility in various substances but did not obtain any favourable results.

The manurial experiments directed by PRIANISHNIKOV (3) with leucite e confirmed the above results and shown the not very satisfactory effect ucite as a source of potash, as may be seen from the following figures:

(1) It may here be mentioned that in Italy leucitic basalt has been worked for leucite by separ- the non-magnetic minerals, leucite and potash-mica (feldspar) from the magnetic sili- of iron and the basaltic magma, by means of magnets. The non-magnetic product contains an ge of 30 per cent of leucite. The cost of preparation is about 17 shillings per ton (cf. LANG- Leucit ein Rohstoff für Kali- und Aluminiumdarstellung: (*Zeitschrift für prakt. Geologie*, p. 80, quoted by Stremme, *loc. cit.*). Recently in Italy this method of obtaining leucite ain raising interest.

(2) E. MONACO: Sull'impiego delle roccie leucitiche nella concimazione. *Le stazioni sperimentagrarie italiane*, Part 7, pp. 577-583 (Modena, 1903). Cf. Stremme, *loc. cit.*

(3) PRIANISHNIKOV: *Landw. Versuchsstation.*, Vols. 63 and 77.

Crop	Without potash	With leucite	With KCl
Millet I.	3.12	3.25	29.24
Oats	4.78	4.81	12.15
Wheat	2.75	4.05	6.40
Millet II.	4.5	8.27	48.68

According to Prianishnikov, nepheline gave better results than leuc As on the shores of the White Sea there are great masses of this mine which, provided there were cheap means of transport, could perhaps be u in agriculture, PRIANISHNIKOV, at M. Fedorov's recommendation, cau experiments to be made with this mineral. The following results w obtained:

Crop	Without potash	With nepheline	With KCl
Buckwheat	1.70	17.60	17.60
Millet	3.70	23.50	34.95

According to these experiments and others made by Prianishniko pupils, some of which, however, have to be accepted with some reser it appears that nepheline is capable of yielding good results as a sou of potash. Further experiments on the action of leucite and of nepheli are desirable to clear up the question finally.

According to Prianishnikov's data the chief mass of the nepheline m eral consists of nepheline, biotite and apatite; further experiments Prianishnikov may show that the good effects of nepheline mineral are n due principally to its content of nepheline (elaeolite) but to the biotite contains.

VALUE OF MICAS AS MANURES.

Both potash mica (muscovite) and magnesia mica (biotite) have a tively high potash content.

The researches of PRIANISHNIKOV (1), BIELER-CHATELAN (2), J. SAMOJ- (3), E. BLANCK (4) tend to show, contrary to the generally received ion, that the potash contained in mica is more available to plants than contained in feldspar.

According to Prianishnikov's experiments the effects of potash mica pared with those of potash feldspar were the following:

Potash fertilizer	Crop of barley	Potash fertilizer	Crop of oats
rol without potash . . .	1.66	Control without potash . .	1.65
, simple dressing	3.93	Orthoclase	—
double »	6.37	. . . . .	—
four-fold »	10.27	» four-fold dressing	2.25
. . . . .	—	» six-fold »	3.50
eight-fold	15.10	» eight-fold »	3.62
ride of potash, simple ssing	22.17	Chloride of potash, simple dressing	15.10

Blanck observed that magnesia mica or biotite, the potash content of ch ranges from 3 to 11 per cent., is superior as a potash manure to ash mica or muscovite, which contains 8 to 10 per cent. of potash.

The above are the chief rocks and minerals which might eventually be d as potassic fertilizers. The researches mentioned in the preceding es prove that, as far as present observations reach, their manurial effect onsiderably inferior to that of the so-called Stassfurt salts and that at sent at least they cannot be discussed as substitutes for the latter. At st some of them may eventually acquire local importance.

The nepheline examined by Prianishnikov seems perhaps to be more ctive than the other silicates of potash, but its potash content is only 3 per cent. Prianishnikov arranges the various minerals according to er of merit as potash manures as follows: nepheline, mica-schist, biotite, lipsite and muscovite, elaeolite, leucite, apophyllite, sanidine, orthoclase, rocline.

(1) PRIANISHNIKOV: *loc. cit.*

(2) BIELER-CHATELAN: *Compt. Rend.*, 1910, Vol. 150, p. 1152 (quoted by Blanck, *loc. cit.*).

(3) J. SAMOJLOFF: *Zentralbl. f. Mineral* etc., 1910, p. 261 (quoted by Blanck, *loc. cit.*).

(4) E. BLANCK: *Journal für Landwirtschaft*, 1912, p. 97.

Though the above order is not perhaps based on thoroughly reliab experiments, yet in the main it is correct and shows that the feldspa richest in potash are the worst sources of potash, for, as is well known, t decomposition of feldspar diminishes inversely with its potash content.

In the above considerations I have not taken into account the conditio of price, as a general comparison can not be made.

Comparison of the Prices of Potash in Phonolite and in Stassfurt Salts.

Such a comparison can only be made with some degree of precision the case of phonolite, as this mineral is already on the market as a pot manure.

The prices of one pound of potash in the forms of kainit, 40 per ce Stassfurt salts and phonolite are as follows:

Part of Germany	Kainit — pence	40 % salt — pence	Phonoli — pence
West: Cologne, 1910 (1) :	0.889	0.940	0.801
Centre: Bernburg, 1911 (2)	0.534	0.828	1.394
» Giessen » »	0.700	0.876	1.031
North: Oldenburg, 1912 (3)	0.892	0.935	1.260
East: Danzig, 1913 (4) , ...	—	0.908	2.403

Thus it is only in the immediate vicinity of the place of production th phonolite can compete with the Stassfurt salts. But even there, if the man rial effect of the mineral be considered, its use does not seem to be profitab

Experiments with the Object of Improving the Action of the Minerals.

Attempts have been made to improve the effect of the ground mine by simply mixing it with certain other fertilizers. Ferd. Schack of Colog has taken out a patent for the following process:

(1) According to Remy: *Ill. landw. Ztg.*, 1910, No. 677.
(2) „ „ Krüger: *Mitt. der Versuchsstation Bernburg*, No. 48, 1911.
(3) „ „ Popp: *Oldenburg Landwirtschaftsheft*, 1912.
(4) „ „ Gerlach: *Landw. Centralblatt für die Provinz Posen*, 1913, No. 3. I perhaps no wholesale price was taken as the basis of the price of phono

ocess for the preparation of manures composed of recent eruptive ls containing potash and combinations of lime. The quantity of ; such, or in combination as cyanamide, nitrate of lime, carbonate , gypsum, to be mixed with the finely ground, unroasted mineral in nt quantity to provide the molecular equivalent of the bases contained mineral.

, means of the exchange of bases the potash contained in the eruptive l is calculated to form combinations assimilable by plants.

TIFFER, BLANCK and FLÜGEL (1) have examined the above process ns of careful experiments, and have ascertained that the effect of the in phonolite is in no wise improved by it.

e experiments of Prianishnikov have shown that the not easily potash of feldspar is not rendered more assimilable by mixing with logically acid fertilizers such as sulphate of ammonia, which on the y increase the solubility of the hardly soluble phosphoric acid of phosphates. This agrees with the fact that neither phonolite nor r has a better effect on acid moor soils than on other land.

CHEMICAL TREATMENT OF SILICATES OF POTASH.

several countries many attempts have been made to render the contained in several minerals, and especially feldspar, more soluble ustrial processes. With this object in view several patents have been ut in America for processes which consist essentially in roasting the potash mineral with lime, or its carbonate or chloride, or common This process is, however, too expensive and it is now sought to potash as a by-product in the manufacture of cement. The question en fully reported in this *Bulletin* (2).

milarly in Sweden, as well as in Germany, the treatment of feldspar has ed. Sulphuric acid and electricity have been applied but hitherto any decisive result (3).

conclusion we may subscribe to the opinion of the Swedish agricul- mist F. VON FEILITZEN, who says: "Even if the above attempts repre- increase of our knowledge on the hardly accessible source of in feldspar as a means of emancipating our agriculture from foreign ertilizers, we are still a long way from the solution of this important ; until we reach it we can be satisfied that in the German potash possess an excellent, quick-acting and not too expensive manure".

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c. *cit.*

t No. 1613, *B.* Dec. 1912.

America great hopes were founded on the treatment of seaweed, from which in reality ntities of potash can be extracted. Nevertheless a factory recently erected in California dustry has already given up treating seaweed as unprofitable.

The Present State of Olive Growing in Italy

by

Prof. F. BRACCI,

Director of the Royal Experimental Station for Oil-making, Spoleto.

From the most remote antiquity the cultivation of the oliv been very important in Italy.

The special conformation of the country, its position in the bas the Mediterranean, that is in the centre of the habitat of the olive mildness of its climate and the fertility of its soil, render the peninsula favourable to the growth and productioness of this oil plant. It i certain whether Italy or Spain occupies the first place for extent of under olives and for quantity of oil produced. Whilst the sourc Spanish statistics are liable to discussion, in Italy at present a diff system is followed in the valuation of the area under olives, a distin being made between the area devoted exclusively to olive trees and which these trees share with other crops. Thus comparison betwee two countries is not possible at least as regards the areas.

The statistics made before the introduction of the new system giv following figures for the acreage under olives :

	acres
Average between 1870 and 1874	2 210 650
» » 1879 » 1883	2 294 630
» » 1890 » 1895	2 663 538
» » 1901 » 1908	2 705 428

With the new system the figures are:

Average between 1909 and 1911	acres
Olive trees intermigled with other crops	4 358 5
Olive trees alone	2 353 5

Considering the figures according to the new sytstem to be corr appears that the area estimated at 2 705 428 acres was in reality 34 acres.

Though we may not infer that the area occupied by the olive has from 2 210 650 acres in 1870 to the present 3 423 420 acres, as the figure may be, and probably is, due to greater accuracy or at any rat different method of estimating the area, there are in reality groun believing that the area under olive trees has sensibly gained in e as a fair number of new plantations are to be seen, mostly better se than the older ones. There was, however, a short period after 1880 d

ich many olive groves were destroyed to make way for vineyards; this ok place especially in Sicily and Calabria.

As for the yield, statistics point to a constant decrease from 1870 to the esent time.

Taking into consideration large averages we get, up to 1908, that is to the new statistics, the following figures for olive oil:

	gallons
Period between 1870 and 1883	73 843 000
» » 1885 » 1896	53 663 500
» » 1897 » 1908	45 988 800

According to recent statistics the average from 1909 to 1912 was 282 000 gals.; but perhaps 50 025 800 gals. would be nearer the mark, as would include the residual oil (including "olio lavato", extracted from ie pomace by washing; "olio d'inferno", collected from the well under ie presses; and that obtained by treatment with carbon disulphide). (1). or comparison, with the returns of the older statistics the figure 43 956 000 gals. should be taken, as it includes only the "inferno" l. It confirms the decreased yield of the olive tree.

The causes of the decrease of production and of the critical state of is crop during the last thirty years are many and of various kinds, namely: eather conditions, parasites, and constitutional and cultural conditions.

Reviewing notes on the oil crop since 1889; it appears that during these 5 years ***drought*** and ***scirocco*** caused more or less injury in 21 cases; ***winter*** osts and ***cold springs***, and ***mists*** and ***rain*** that injured the flowering, in 7 ases; the ***olive fly*** caused serious and general injury in 10 cases; lesser or artial damage, together with ***Rhynchites*** and ***Phlaeothrips*** and other insects 17 cases; ***Cycloconium*** caused partial injury from the year 1902 onwards nd since 1910 with increasing gravity and in almost all the growing districts. rom the above it is seen that the most efficient cause of injury is the almost onstant ***drought***, which is easy to understand if one remembers that the live tree grows mostly on hills and mountain slopes and most frequently ithout the necessary work being done to retain the rainwater, while the

(1) Whilst in the old statistics the quantity of oil was ascertained directly from that ained during the season in each commune, with the new system the quantity of olives ecorded and the quantity of oil is calculated according to the average yield in the mill the various districts. This yield does not include the "inferno" oil, nor that obtained washing or treating with carbon disulphide, though these oils also are put upon the rket; the first of these oils is used to a great extent as food by the poor, who often der it to the better oils; it is also used, as well as that obtained by washing and by atment with disulphide, in the industries. The "inferno" oil may be calculated at about per cent. and the other two oils at 2.5 per cent. of the crushed olives.

olive tree requires a good deal of moisture, which, as Giglioli (1) says, is the manure *par excellence* of the olive tree, especially during the growth of its fruit. Next in order of importance come the serious attacks of the *olive fly* and other animal or plant parasites, the development and spread of which are to a great extent dependent upon the abnormal physiological and cultural condition of the trees which we shall briefly consider.

In the first place let us examine how the olive is cultivated in the various regions of Italy (2) (see Table I).

TABLE I.

Region	Intermingled culture acres	Specialised Culture acres	Total acres
Piedmont	—	—	—
Liguria	62 738	88 426	151 164
Lombardy	9 139	3 705	12 844
Venetia	2 717	4 693	7 410
Emilia	16 549	—	16 549
Tuscany	685 919	26 182	712 101
Marches	425 581	—	425 581
Umbria	141 778	17 043	158 821
Latium	126 711	40 508	167 219
Abruzzi and Molise	657 514	4 940	662 454
Campania	446 082	106 210	552 292
Apulia	545 376	712 101	1 257 477
Basilicata	42 484	40 014	82 498
Calabria	491 530	141 284	632 814
Sicily	696 787	117 078	813 865
Sardinia	7 657	51 376	59 033
Total	4 358 562	1 353 560	5 712 122

(1) SOCIETÀ DEGLI AGRICOLTORI ITALIANI: Di alcune condizioni che influiscono l'efficacia dei concimi chimici. Rome, 1903.

(2) MINISTERO DI AGRICULTURA, INDUSTRIA E COMMERCIO. — UFFICIO STATISTICA AGRARIA. Prospetti riassuntivi dei XX prodotti rilevati nel quadriennio 1909-1912. 12, June 1913.

s the above table shows the olive tree is grown in all the regions of
ave in Piedmont, but two thirds of the olive groves are in the south
peninsula, the provinces of Apulia, Sicily and Calabria occupying in
spect the foremost positions.

ully three-quarters of the olive groves are under intermingled crops,
they contain besides olive trees other plants, most frequently cereals
t and maize) which are grown up to the very trunks of the trees;
of the groves consist of old irregularly arranged trees, often in rows
g straight down hill on very steep soils, or without sufficient protection
t the surface water which lays their roots bare. In those groves
r (the older ones) formed exclusively of olive trees, they are often too
together so that the crowns in their struggle for light and air grow
reat height; as much as 33 to 48 feet; this may be seen in Calabria,
guria and in some parts of Tuscany.

he number of different varieties scattered at random in the groves is
enable; there is also much confusion in their names; nevertheless the
er of the prevailing varieties grown for oil in each region is relatively
d. The following may be noted as being the most frequently met with
ne richest in oil:

n Liguria: *Taggiasco.*

n Tuscany: *Razzo* or *Frantoiano, Moraiolo* or *Morinello,* and *Leccino.*

n Umbria and the Marches: *Raio* or *Razzo, Moraiolo,* and *Carbonella.*

n Latium: *Carbognola* or *Marsella,* and *Verniera.*

n the Abruzzi: *Nordana, Gentile* and *Olivone.*

n Apulia: *Paesana* or *Baresana, Coratina, Monopolese,* and *Ogliarola.*

n Calabria: *Ottobrarica, Coccitanica, Mammolese, Nicastrese, Cumi-*
, and *Roggianese.*

n Terra di Lavoro and Molise: *Aurina* and *Caiazzana.*

n Lombardy and Venetia: *Casaliva* or *Nostrana,* and *Drop* or *Tombolct,*

n Sicily: *Ogliaia, Calamignara,* and *Cerasola.*

n Sardinia: *Maiorchina* and *Genovese.*

n general, among the above-mentioned varieties that give the most
d fruit, there are others called *Olivastri, Olivastroni* or *Olivastrelli,*
se they are hardier, more resistant and more constant in bearing fruit
the preceding varieties, but their fruit does not contain so much oil
it as delicate. These latter varieties deserve greater consideration
w of the exhaustion and low productiveness of the other varieties due
ir having been multiplied a vegetatively during centuries and to their
f resistance to unfavourable conditions.

n fact for centuries the olive trees have been multiplied by means of
puppole, as the egg-shaped buds which are formed at the base of
tem are called in Tuscany, Umbria, Latium and Reggio Calabria,
ich regions this method of multiplication is used. In the Marches,
a, Abruzzi, Catanzaro, Cosenza and Sicily cuttings (*talee*) are used,
n Liguria, Lombardy, Venetia, Latium and some parts of Sicily the
s that grow at the foot of the tree (polloni) are preferred. Less fre-
is the use of wild olive trees, as in the districts of Lecce, Capitanata

Grosseto and Sardinia, and still more rarely recourse is had to plants obta by sowing the olive stones. The result of the above vegetative method been to perpetuate the defects of the mother plants, such as canker, an resistance to frosts, drought and parasites. To the harm caused by t original defects, the injury caused by neglect or unsuitable pruning, ma ing, tillage of the soil and control of parasites is frequently added.

As for pruning, while the necessity of practising it at short inter possibly every year or at least every two is being gradually recognized, the custom of pruning every three or four years is still very preval there are some important oil-producing districts, especially in the so where as many as seven or eight and even ten years elapse betwee pruning and the next (1).

In Italy there are some centres in which capable pruners are found; they are much esteemed and sought for abroad (Dalmatia, Istria, Gre There are also schools which prepare pruners by means of practical cou A wider diffusion of the sound principles of olive pruning would be desirable, because in several regions nothing could be more capricious, sup titions and ignorant than the way in which this, the most delicate of tural operations and intimately connected not only with the product ness of the tree but with its vegetation and resistance to disease, is car out. Some think that they must cut blindly, topping and even pollarding tree; others treat the olive like the mulberry; others, again, scarcely to the tree, notwithstanding the length of time that is allowed between successive prunings, for fear of removing too much foliage (parts of Cala of Sicily, of Tuscany, of Liguria). Some lop off a main branch every year leaving the rest untouched, with the idea of thus rejuvenating tree (!) while in reality they favour the spread of canker (Umbria). O pruners train the main branches nearly horizontally, hollow out the c and cause the tree to produce a number of low hanging branches reac almost to the ground (Bari, Potenza and Florence districts, part of Um etc.), while others keep the whole framework of the tree almost vertical remove all the lower branches or allow the tree to grow naturally, in ne case considering the special conditions of the tree nor the requirement the variety, etc.

As for manures there are districts where little or no manuring is d some in which manures are given once every three or four years, others in which the olive tree is frequently and well manured. general farmyard manures (from horse stables and cattle and s sheds) are given; sometimes pure sheep or goat dung or night is used. The animals are often run in the olive groves for the sake of droppings; less frequently woollen rags, leather waste, hoof and shavings, fish residues, silkworm chrysalides, olive pomace and the

(1) SOCIETÀ DEGLI AGRICOLTORI ITALIANI: *L'olivo e l'olio in Italia*, Monograph pr at the International Exhibition in Paris, 1900.

IDEM: *Inchiesta eseguita sulla propagazione e concimazione dell'olivo*, 1912.

plied as manure. Mineral substances, such as builders' waste, ashes
a limited extent chemical manures, or vegetable matter, either pre-
rotted or not, such as seaweeds, swamp grasses, leaves of forest trees,
pine needles, etc., are given. Lastly leguminous green manures
, beans, vetches, etc.) (1) are used, but only to a very limited extent.
y the olive trees grown together with other crops get the best treat-
as they profit by the manure given to the latter.

s for tillage, in general little is done: the ground is hoed or ploughed
a primitive implement at long intervals, generally once a year,
ice at the utmost, and this while drought is one of the weather
ions that has the most depressing effects upon the yield.

s for the diseases that attack olive trees there are a number of them:
, bacterial tumours, root-rot, olive fly, weevils, scale insects, *Psylla*
Rhynchites, *Phlaeothrips*, fumago, *Cycloconium*. *Stictis Panizzei*, are
ief diseases which have always with more or less virulence attacked
ve tree already apparently suffering from senility. There is no doubt
t present the most injurious pests are *Phlaeothips* and *Cycloconium*
tter especially, both of them destroying the foliage of great
s of olive groves. *Cycloconium* is all the more dangerous inasmuch
ough the ignorance of the great mass of olive growers its action is
ally insidious. The farmer notices an unusual fall of the leaf, usually,
ing, and gets alarmed. But soon, new leaves appear, the olive
again green and the farmer is reassured, especially when he sees a
n amount of bloom showing, which is the case if the disease is not far
ced. But meanwhile the flowers and the young fruit fall, the oil
nil, and by the end of the succeding winter or in spring the leaves fall
and more plentifully. The olive grower gets discouraged and aban-
he olive trees to themselves, depriving them even of the scanty care
then bestowed upon them. This happens now in a great part of
and it is urgent to have recourse to the more or less perfect remedies
re known: that is to spraying with salts of copper in order to prevent
rmination of the conidia of the fungus, and to the intensive culture of
ve tree as indirect means of increasing its vigour and resistance to
e.

ortunately for Italy, by the side of the old unproductive and perish-
ive groves there are others either recently planted or restored to
which are carefully tended, pruned, manured and systematically
ted against diseases; these show clearly that no fear need be entertained
he extinction of olive cultivation, but on the contrary demonstrate
at utility, especially on hill slopes where no other culture would
sible or advantageous. And if the results of experiments recently
ted in various parts of Italy on the improvement, management

(1) See pamphlets already quoted: CONSOCIAZIONE DEI COMIZI AGRARI ITALIANI, *Sulla*
zione chimica e con sovesci delle viti e degli ulivi. Risultati d'inchiesta in Italia. —
ro CUAGLIOTTI, relatore. Terni, 1912.

and manuring of olive groves become widely known and lead to the lowing measures being adopted, there is no doubt the olive in Italy soon resume its place among the most paying crops.

The most important measures for the improvement of the olive g are : thinning out of those that are too crowded, thus freely admittin sun, a great enemy of most parasites; gradually and systematically pr the trees so as to oblige those that have grown too tall to throw out branches nearer to the ground ; replacing the old decaying trees by seed that have been grafted to the varieties most suitable to the various l ties and which can now be easily prepared in every farm or can be bo from the best nurserymen of Tuscany (Pescia, Pistoia, Florence) and parts of the country ; a suitable arrangement of the steep slopes and the hoe or the plough together with green manuring so as to keep the n sary moisture in the soil during the summer ; returning to the soil th cessary fertilizers, particularly those containing phosphoric acid potash (and lime in some cases), and lastly spraying with mixtures con ing copper against *Cycloconium*, which operation is rendered easier by thinning out and lowering of the crowns of the trees, and using eventu other treatments to control other pests.

The Recent Development of Cattle Breeding in Sweden

by

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I. — INCREASE IN THE NUMBERS OF LIVE STOCK.

The northern position of Sweden makes it naturally more suitab the rearing of live stock, particularly cattle, than for grain growing; th ture is all the more pronounced in the north, and Norrland produces very small proportion of the grain required by its inhabitants.

The live stock of the country consists of horses, cattle, sheep, pigs, poultry and reindeer, the latter belonging to the nomad Lapps high north. The numbers at the end of 1911 were as follows :

Horses under three years	493 322	
Horses over three years	95 165	
		588 487
Cattle		
Steers	144 277	
Bulls	52 467	
Cows	1 837 035	
Young stock	655 830	
		2 689 609
Sheep		945 709
Goats		66 136
Pigs		951 164
Poultry		3 961 141
Reindeers		276 084

If the various classes of stock (horses, cattle, sheep, goats and pigs) re calculated as cattle units (1), we get the figures shown in Table I as dicating the increase in the numbers of live stock in Sweden in the last alf century.

TABLE I.

Year	Cattle Units	Per 1000 inhabitants	Per 1000 acres of area	
			total	of arable and permanent grass
865	2 591 037	630	26	245
875	2 863 006	653	28	247
885	3 093 955	661	30	252
895	3 367 999	685	33	272
905	3 406 961	643	33	263
911	3 617 472	655	35	291

Thus the live stock population has steadily increased ; but since 1895 e increase of the human population has been more rapid than it. The ct that the number of cattle units per area of land has steadily increased rough this period would lead one to expect a similar increase in the area der green crops, and the agricultural statistics show that this is the case. is increase has been especially in root crops for feeding, but the yield of y on the temporary grassland has also increased considerably.

Sugar beet growing hardly existed 25 years ago ; by 1890 the yield was 0 700 tons and in 1911 it had risen to 950 300 tons. The crop of roots for eding (mangels, carrots, turnips and swedes) increased from 3 235 000 shels in 1865 to 98 351 000 bu. in 1911. In 1890 the crop of hay from mporary leys was 2 $^{3}/_{4}$ million tons, but lately it has exceeded 4 ¼ mil- n. Green crops have also extended considerably, especially in the north, t there are no statistics for them. Further, the increase in grain crops is meant more straw available for feeding.

By means of this increase of fodder resources it has been possible to ing up the stock of animals; the development has been greatest with ttle and pigs, both in quantity and quality. The numbers of the horned ock of different types are shown in Table II.

(1) One cattle unit = 2/3 horse, 1 beast, 8 sheep, 12 goats or 4 pigs, two young imals of any class are equal to one adult of the same class.

TABLE II.

Year	Steers	Bulls	Cows	Young stock	Total
1865	282 844	38 791	1 185 556	417 163	1 924 354
1870	269 762	38 674	1 231 477	426 014	1 965 927
1880	289 071	47 985	1 409 236	481 465	2 227 757
1890	253 735	49 066	1 578 927	517 763	2 399 491
1900	218 932	51 390	1 764 819	547 414	2 582 555
1905	184 328	49 444	1 763 857	552 299	2 549 928
1910	152 925	54 703	1 861 219	678 679	2 747 526
1911	144 277	52 467	1 837 035	655 830	2 689 609

Only the steers have shown a permanent falling off in numbers; they are kept in Sweden only for work, this is due to the increase in t wages of labour, which has made horses more economical owing to th quicker going. The fact that the number of bulls has not increased as rapid as that of cows, or has even decreased in some years, is probably the res of the extension of cooperative bull societies, which has meant considera economy in the number required. Except for a slight relapse in 19 caused by shortage of crops, the cows and young stock have shown a lar and steady rise in numbers, reaching over 55 per cent. in the period.

For a just appreciation of the enhanced value of the horned sto more attention must, however, be given to the improvement in quali which has greatly exceeded the numerical increase

II. — IMPROVEMENT OF THE BREEDS.

When towards 1840, general interest began to be aroused Sweden in the improvement of the cattle, the prevalent opinion w that the indigenous breeds were so inferior that the only way improve them was by crossing with well-known breeds from oth countries. A number of herds of various breeds were import to find which would be the best for the purpose. The only two bree which gained the confidece of farmers were the East Friesian (from Holla and Ostfriesland), and the Ayrshire; these breeds have become so wi spread and have been so largely used for crossing that the indigenous bree have almost entirely disappeared in the southern and central parts of t country, the introduced breeds have taken their place either pure or as cro breds. A reaction against this excessive importation began towards the e

century. The two introduced breeds had developed so well that it ger seemed necessary to depend on continued importation, which was s uncertain for the breeder; little by little importation has become less tant, and rational selection of the breeding stock has led to such a pment of national breeding that Swedish East Friesians and Ayr- can compete with the animals in their original homes; recently of both breeds has been exported at very good prices.

esides this, some more or less wholly indigenous races have been de- d. In Central Sweden there were a number of gentlemen's herds ded from the native red or yellow cattle, but containing a good deal tch, Shorthorn and Ayrshire blood; they combined a good milk yield onsiderable weight and early maturity. The owners of these herds ned to form a uniform breed without using imported animals, and fforts have been so successful that the race thus evolved, the Red Spot- vedish, has now been recognized as a pure breed. They are most like ires, but make better butcher's beasts than these.

While the above-mentioned breeds have done well in the more fertile of central and southern Sweden, the same cannot be said of the north country, where feeding is much more scanty and the beasts have to their food in the forest in summer. In these parts, the indigenous cattle, white or spotted on a white ground, was retained; this breed, as the Fjäll, gave little in the way of milk or meat, but was accus- to unfavourable natural conditions. It was generally believed that w production was a direct result of the conditions of life, and that g better was to be expected. All the same, a beginning was made thirty years ago at attempts to improve the breed by better feeding election of the best milking strains. The result of these efforts is that are now a number of small herds which give an average yield of 6000 nd more of milk a year, a very satisfactory amount in consideration ir live weight; this, though increased a good deal, hardly exceeds s. for cows.

The uncertainty as to choice of breeds has now ended, and each district ed on one or more of the four breeds mentioned: 1) East Friesian, in the fertile districts; 2) and 3) Ayrshire and Red Spotted Swedish, where onditions are not quite so favourable; and 4) Fjäll, where the poor and forest pastures have to be used.

Besides the Fjäll there was another polled breed, red in colour, of which few remnants remained scattered in out-of-the-way districts in various of the country. In the last few years these have to some extent been ed together to make a pure breed, the Swedish Red Polled cattle, and ults already obtained with some herds look encouraging.

III. — Milk Yield.

The progress realized in the productivity of the cattle can also be om the figures for production of milk and butter and for increase of ight. The official statistics do not give direct information on these

points, but our statisticians have attempted to estimate the figures milk production. Thus M. Gustav Sundbörg works out the average yield per annum as follows:

About	1870	2 600 lbs.	per cow
»	1880	3 100 »	»
»	1890	3 700 »	»
»	1903	4 200 »	»

Another author, M. Nils Hansson, an authority on the dairy-f of the country, has estimated the present milk yield at an average lbs. The three first figures of M. Sundbörg's table are very uncer they come from a pure estimation of the production of the differe vinces, in which the breeds, feeding and management are very variabl figure for 1903 is already an improvement, as it is the result of esti of the mean annual production made in every parish throughout the co the 1912 figure is still more trustworthy, as it is based on the latest from the Dairy Control Societies.

Under these societies, numbering 749 in 1911-12, no less than cows, or nearly 11 per cent. of the total number in the country, we mitted to careful control; the results are as follows.

The mean annual yield per cow was 5748 lbs. of milk, with an fat content of 3.50 per cent., corresponding to 201 lbs. of butter-fat lbs. of butter. As the control herds are among those in which syst efforts for improvement are made, M. Hansson has deducted 20 p from this yield to get the average for the whole country, giving th quoted above.

The great variation of yield in different parts of the country can b by parallel figures from the two provinces giving respectively the and lowest yield (Table III).

TABLE III.

Province	Average yield		Number of cows under	
	milk lbs.	butter lbs	total	per of to
Malmöhus: average	8 087	289,6	46 084	3
highest society	10 392	364,8	324	
lowest society	6 200	239.3	64	
Vesterbotten: average. . . .	4 388	154,3	2 569	

On the basis of these figures, the total milk prodution has been calcula- as follows:

1875	about	3100	million	lbs
1885	»	4100	»	»
1895	»	5400	»	»
1905	»	6600	»	»
1910	»	13200	»	»

The progress in milk production led to a corresponding development of dairy industry. Formerly the treatment of milk was a household affair, l it was not till 1865 that the first dairies were started. The earliest s were established by the owners of large estates to use the milk from ir herds; these may be called "*estate dairies*"; but gradually *commer- l dairies* came to be started by private persons or companies. They re not connected with any form of farming and treated purchased milk. e great profits which the proprietors of these dairies often made and the ficulties which arose from the lack of interest of the farmers in the qual- of the milk sold to the dairy, combined to produce general discontent ih this type of dairy; towards 1890 *cooperative dairies* were started; in se the farmers shared according to the amount of milk supplied and the content was soon also taken into consideration.

This type of organisation has proved very advantageous, both as gards better quality of the milk and the products turned out, and in ing better financial results. The consequence is that the cooperative iries have gained on the estate and commercial ones, as shown by e figures in Table IV.

TABLE IV.

	1890	1900	1905	1910
al number of dairies . .	1 562	1 793	1 575	1 461
Estate	809	624	399	
Commercial	610	529	536	
Cooperative	73	302	470	
lk treated . . . . . lbs.	1 115 784 000	1 856 909 000	2 024 050 000	2 533 590 000
tter produced . . . »	35 480 000	58 657 000	62 791 000	73 983 000

The diminution in the number of dairies in the last few years is due to concentration of the industry, consisting in the disappearance of many small mpeting establishments in favour of larger and better organized ones.

The chief object of the Swedish dairy industry has always been the production of butter; a part of this, increasing up to 1896 has been exported particularly to England, to which country it goes direct or via Denmark.

The total exports for the last fifty years have been in round numbers:

1861-65	355 800 lbs.	1886-90	31 074 000 lbs.
1866-70	248 900 »	1891-95	44 147 000 »
1871-75	6 954 700 »	1896-1900	48 074 000 »
1876-80	9 248 000 »	1901-05	42 718 000 »
1881-85	17 678 000 »	1906-10	40 857 000 »
	1912	45 717 000 lbs.	

VI. — Butcher's Beasts

Before the beginning of the dairy industry and the exportation of butter, attempts had been made to export live cattle to England. The success of this enterprise was not great, owing to the poor quality of the Swedish cattle; but as the increasing interest in milk production gradually led to better feeding and consequent greater body development, the exportation of butcher's beasts became more important, till it was put an end to in 1892 by the prohibition of introduction of live cattle into the British Isles. Efforts to turn the exportation to Germany were also soon frustrated by similar measures in that country, but since the beginning of the new century exportation of live cattle and meat has developed again; it is directed chiefly to Germany and Switzerland.

Table V.

Annual exportation of cattle and meat from Sweden.

Year	Bulls	Steers	Cows	Young stock	Value
					£.
1881-85	1 207		30 660		317 400
1886-90	2 489	13 135	15 265	1 981	368 600
1891-95	3 935	5 481	9 300	955	203 650
1896-1900	2 292	1 253	5 265	1 010	103 550
1901-05	3 577	404	7 038	3 558	118 900
1906-10	3 365	563	8 284	4 971	190 950
1911	6 974	6 946	19 711	13 340	566 200

The importation of live cattle and meat into the northern industrial ricts, chiefly from Finland, has never been of much importance. 1911 the value was £. 34 600.

Naturally the better feeding has increased the live weight of the cattle. tistics do not give any direct evidence on this point, but it can readily demonstrated from material taken from the reports of the breeding eties. Thus, the normal weight of Ayrshire cows, which are the most spread in the central and southern provinces, was estimated at 1000 to 0 lbs. about 1890; at present it averages 1100 lbs. The weight of Friesian s, which are kept chiefly in the fertile province of Malmöhus, has also roved, and is now reckoned at 1300 lbs. The Red Spotted Swedish, eloped chiefly by crossing with Ayrshires, occupies an intermediate ition between these two breeds as regards live weight of the cows. The e progress can also be observed in the two native polled breeds — the ll (white and spotted), predominating in the north, and the Swedish l Poll, which is the most southerly branch of the hornless cattle. For Fjäll breed, the normal weight of the cows was estimated at 660 to lbs. in 1890, and it now reaches 770 to 810 lbs.; the live weight of the l Polls may reach even 840 or 880 lbs.

V. — Organization.

The development in the stock of cattle to which we have drawn ention is naturally the result of the efforts and care of the mers themselves, but it has been greatly encouraged and facilitated by ious measures taken by the authorities carried out at the public expense. the first place should be mentioned the regular shows, with prizes distri- ed on a uniform system ("Flach System"); these were begun in the pro- ce of Skaraborg in 1882, and in 1892 were organized in all the provinces h the help of grants from the Government and the Agricultural Societies; h province forms a prize district. The idea of these shows is to bring to ht all animals fit to be used for breeding and to classify them by prizes ording to their value for the purpose. For each approved cow, the owner eives a service ticket for each year, giving the right to put the cow to a ize bull of the same breed; the owner of the bull is then paid for the tickets a rate depending on the class in which the bull was placed.

These shows are specially intended to improve the stock of small far- rs, and they alone are entitled to prizes and service tickets for cows. But, ing to the sums brought in by the service tickets to the owners of cially good bulls, the Flach system also encourages high-class breeding ong the wealthiest farmers.

These shows, which are generally held every other year in a locality, ve been very valuable in bringing farmers to recognize the importance of eeding from good stock. Another result has been that in each district e or two breeds have been fixed upon as specially appropriate for the tural and economic conditions of that district.

The shows have continued to increase in number, and at the same tim the proportion of the cows approved has become higher. In 1910, 62 6 animals were examined, and 55917, or 89 per cent., were approved or give prizes. The expenses for the year reached about £18 000.

As we have just shown, the giving of prizes and the money brough in by service tickets may make the keeping of bulls a profitable busines to this circumstance is due the formation of coperative bull-keeping societie The provincial agricultural societies encourage these societies by loan without interest for the purchase of bulls and by special prizes at the show The formation of these societies has developed at about the same rate a the shows, and there are at present about 1200 of them, distribute throughout all the provinces of the country.

Another measure in connection with the shows has been the establis ment of herdbooks for the more important breeds. These have general been drawn up and published by the provincial agricultural societies soo after the starting of shows on the system described. Registers for certai breeds have also been established by the societies for the improvement these breeds (Ayrshire and Red Spotted Swedish). Lastly, the Governme has undertaken the preparation of herdbooks for one or two breeds; these, the Ayrshire is the only one yet published, but the Fjäll will appe shortly.

Next to the shows, the Control Societies have contributed most large to the great progress in live-stock breeding and the improvement of t economic position of stock farmers. The first society of this nature was found in 1898, and at the and of 1912 the total number was 749, distributed throu all the 24 provinces of the kingdom. The largest number, 160, is in t province of Scania, which is the most populous and best cultivated part of t country; but these centres of advancement in the economy of live stock occ right up to the desolate regions of Lapland.

The effects of the regular control organized by these societies have eve where been seen in the disappearance of the cows that gave the small return for the food consumed and in a more severe selection of the anim to breed from; the consequence is that the average milk yield has sho a more or less rapid rise. In the earlier years this rise was largely due better feeding; the amount of food per cow, as well as in relation to the m yield, often rose for a time; but the farmers soon learnt to make up m suitable rations, and the number of fodder units diminished in propor to the milk produced, and often also absolutely.

By publishing the results obtained yearly for each herd, the con societies very soon made known the productive capacity of the herds well as of the individuals composing them. From the beginning of the p sent century, the control figures for the production of milk and butter- have been used along with the external points and pedigrees for judgi the animals at the great national shows held every five years (last in 191 But these control figures are not deemed sufficient for judging the breedi value, especially in highly selected strains.

meet the need for more searching examination of the animals for this
, which is particularly required in the distribution of the great State
or breeding stock, competitions of breeding centres have been estab-
The herds entered for these competitions are submitted to careful
for two years ; the observations extend to quantity of milk and but-
produced and consumption of food for each cow, and uniformity,
and vigour for the herd in general. Such competitions have been
d twice, in 1903 and 1908, and a third will begin this year. The
ion of being classed as a breeding centre has been found to be of such
rable commercial advantage that at present money prizes are no
distributed except for herds of the Fjäll breed, which as a rule belong
l farmers.

e direction of the official measures just described is entrusted to com-
appointed by the Government and the Provincial Agricultural So-
but besides these, the breeders have formed societies for the different
. The first of these was the Red Spotted Swedish Society, formed
; in 1899 the Swedish Ayrshire Society was founded for the deve-
t and consolidation of the various strains of Ayrshires occurring here
re over a large area, and of very varying types. These two so-
organized the registering of animals descended from those entered
Ayrshire Cattle Herd Book and given a certain annual yield of
fat. For the Red Spotteds, cows must give 220 lbs. of fat, and bulls
e out of dams giving 265 lbs. The minimum for Ayrshire cows is
, during each of two successive years.

facilate the purchase of good breeding stock, each of these societies
es two auction sales a year; at these, registered bulls, free from tuber-
and approved at an inspection immediately preceding the sale, are
to the public.

ring the present year, two new societies have been founded to work
same lines as those already mentioned, one for the Friesian breed
: other for the Swedish Red Polls.

SECOND PART.

ABSTRACTS

AGRICULTURAL INTELLIGENCE

GENERAL INFORMATION.

1126 – **National School of Waters and Forests at Nancy (France).** — Guyo in *La Vie agricole et rurale*, Year II, No. 35, pp. 224-230. Paris, August 2, 1

A State School of Forestry was founded in France in 1824, an years later was established at Nancy where its headquarters have rem ever since. These consist both of educational buildings and of resid quarters for the State scholars and for the staff; special mention s be made of the museums, where extensive forestry collections of dif kinds have been accumulated. There are further 7625 acres of forest the direct management of the School; the greater part of this is i neighbourhood of Nancy (Forests of Haye and of Amance) and th in the Vosges Mountains about 40 miles distant (Forests of Elieux a Ban d'Etival). These four forests provide examples of various types and of forest management, and together with a nursery on the outski the Haye Forest, where there is also a piscicultural experimental st and an arboretum at Amance, complete the equipment of the Scho

The students may be divided into two classes: the so-called "regu students or State scholars and the "free" students. The former are who have already taken their diploma at the State Agricultural C ("Institut National Agronomique") and have further been subm to a competitive entrance examination in mathematics and modern guages. Occasionally a graduate of the Polytchnic School ("Ecole technique") is admitted directly and without competition. The total ber of these State scholars varies from 12 to 35 according to the of the Forest Service, and at present they number 18. When enterin School they sign a contract for four years, the first and last of whic spent doing military service, while the two intermediate yeas are sp Nancy. During the latter period, the scholastic year is divided int terms: the winter term from October to April, when the work co

of lectures and laboratory work, and the summer term April to t, when the work is wholly of a practical nature and takes place in hool forests. Further, during the two years, two months are spent g forests in other parts of France, and throughout the whole course ain amount of military instruction is given and a fairly strict discipline intained. After leaving Nancy the State students complete their ry service by serving for a year as sub-lieutenants in an infantry ent and then pass into the State Forest Service.

he second class of students consists chiefly of foreigners, who are ad- l to the School and allowed to follow the course of instruction wholly part. The latter embraces forestry and its applied sciences, forest ying and forest law.

he teaching staff consists of seven members of the Forest Service, itary instructor, and a lecturer in Letters and modern languages, the management of the School forests is in the hands of two special officers who were originally appointed to take charge of the experi- al work.

Travelling Schools for Rural Domestic Economy (France).— DUCLOUX, A., *La Vie agricole et rurale*, Vol. 2, No. 38, pp. 305-308. Paris, August 23, 1913.

hough the first travelling school for Rural Domestic Economy in France nly founded in December 1905, at the present day 30 such schools 2 others are to be opened shortly, and the formation of yet 6 others ler discussion. Many of them give short summer courses in training es of their districts. On the whole it may be said that the instruction ng appreciated by farmers and their families, and that the movement oving a success.

The Agricultural Institutions of Spain. — DE LA ROSA, GUMERSINDO FERNANDEZ. Apuntes históricos sobre los progresos de la agricultura española en los cincuenta años ultimos. — *Boletín de agricultura técnica y economica*, Year V, Nos. 49-54, p. 63-72, 167-176, 236-244, 335-345, 449-460, 521-532. Madrid, January-June, 1913.

his article gives a historical summary (accompanied by general re- s on rural and political economy) of the more important facts concern- he progress of agriculture in Spain, especially in the south-west district, g the course of the last fifty years. The writer brings into prominence easures taken by the Government for the encouragement of agricul- and agricultural instruction.

A RoyalDecree of 1855 founded the " Escuela general de Agricultura ". of the first agricultural engineers who studied there founded, in 1862, Sociedad El Fomento Agricola " at Jerez de la Frontera; to this society the introduction into Spain of the first mowing and threshing machines. innovations, and the introduction of *Hedysarum coronarium* L. (" sul- which necessitated horse-rakes and hay-makers, into the southern district of the Peninsula, gave a great impetus to agriculture and to -breeding industries in that district.

rom 1875 to 1879, the extension of the " Instituto Agricola de Alfonso was provided for by a series of legislative enactments. This Institute

was the former "Escuela general de Agricultura". The law of August
1876, dealing with agricultural instruction, created chairs of agricultu
in all the colleges ("Institutos") of the Kingdom. The "Asociación
agricultores de España" dates from about the same time, and ha
the merit of having organised shows, competitions and congresses
The "Exposición Nacional Vinicola" of 1877 was on a magnificent scal
Unfortunately, phylloxera made its appearance shortly afterwards in Spai
and destroyed over 7 million acres of vineyards. The spread of the pests w
arrested by reconstituting the vineyards with vines on Amerian stocks.

The Royal Decree of February 14, 1879, created the "Cuerpo de Ing
nieros agronomos", and the "Junta consultiva inspectora". In 188
a stallion depôt was added to the "Instituto Agricola de Alfonso XII
which was later attached to the "Estacion pecuaria de la Granja central"
this latter is still in existence.

The Royal Decree of December 9,1887, gave its sanction to the organ
sation of the Corps of Agricultural Engineers; another decree dated Decem
ber 13, 1887, provided for the creation of different Experimental Farm Schoo
("Granjas-Escuelas experimentales de Agricultura"). The "Granja expe
mental" of Saragossa contributed in a great measure to the improvemen
of beet cultivation; this crop has in some parts (in the neighbourhood
Malaga and Motril) replaced sugar cane. The first beet sugar factory w
established in 1882 at Cordova; others were subsequently opened
Grenada, Antequera, Aranjuez and Vico.

The oldest of the model farms which still exists is (after the "Gran
central", annexed to the Agricultural school of Moncloa) that of Saragos
which was established by Royal Decree of September 23, 1881. The sa
decree also created the model farms of Grenada, Seville and Valladol
these were, however, suppressed after some years. A Royal Ordinance
June 2, 1882, instituted the "Granja levantina," which is situated in t
"Jardin Real" near Valencia; on January 16, 1889, the "Granja-Escu
experimental" of Jerez de la Frontera was created, followed during the sa
year by the model farm of Corunna, and the next year by that of Barcelo
Those of Valladolid, Valencia, Jaén, Badajoz and Ciudad Real have o
been in existence for some ten years; the model farms of Navarre and
Santa Cruz (Teneriffe) are in course of development; those of Melilla (creat
in 1910), Salamanca (created 1911), Cordova, and the Balearic Isles (creat
in 1912) are beginning operations.

To the "Escuela Especial de Ingenieros agronomos" and the "Gran
Central" are annexed stations for the following branches: agriculture, pl
diseases, seed selection, vine growing, stock breeding and machine testi
For a long time, vine-growing stations have existed at Haro, Villafranca
Pandaes, Toro, and Reus (the latter is now transformad into the sch
of Vine Growing and Wine Making); while those of Calatayud, Cocentai
Jumilla, Requena, Valdepeñas, Aranda de Duero, Felanitx (Balearic
and Orense are of more recent date. Funds hare been granted for the est
lishment of 14 "Estaciones de Agricultura generale" at Arevalo, Albac
León, Lorca, Segovia, Zamora, Asturias, Burgos, Castellón, Motril, Mal

res, Fonsagrada and Alcalá de Henares. There is a Sericulture Sta- at Murcia, and others are about to be established at Aranjuez and Puerto anta Maria (Cadiz). Dairy Industry Stations exist at San Felices de ma (Santander) and at Nava (Oviedo); and there are Stations for Irri- l Crops at Binéfar (Huesca), as well as at Seville (" Granja provincial de so XII "), a Rice Culture Station at Huesca (Valencia), and experi- al oliveyards at Tortosa (Tarragona), Hellin (Albacete) and Lucena ova).

The law of July 17, 1895, regulates surveying operations. In accordance Royal Decrees of August 14 and of October 20, 1895, a trial beginning made in the Province of Grenada. The law of August 24, 1896, provi- for the establishment of the survey of crops. In 1899, surveys were in the Provinces of Cadiz, Cordova, Malaga and Seville. The present led survey was regulated by the law of March 23, 1906.

Since 1900 the Government has given a great impetus to irrigation works. Royal Ordinance of 1903 commanded the publication of the work en- " El regadío en España " (Irrigation in Spain) compiled by the Council griculture from the reports forwarded from the provinces by agricultural neers. The Royal Decree of May 11, 1900, reorganized the Hydro- al Service; seven divisions were created for hydraulics, and important es for canals and reservoirs were begun; some of these are in course of truction. At the present time, Spain possesses nearly 4 million acres igated land (counting the areas which are irrigated when water undant).

It has long been known that the cotton plant flourishes in some parts pain; nevertheless, the Spaniards have almost entirely ceased cultiv- this crop. With a view to encouraging the cotton-growing industry, aw of July 19, 1904, granted £ 16 000 in prizes (to be awarded over three s), and also exempted the cotton crop from taxation. The Council of culture was charged with drawing up the regulations for the execution e said law, but their precautionary and restrictive measures (published oyal Decree on January 28, 1906) made the latter a dead letter.

In conclusion, the writer gives some suggestions as to the part which ld be played by the Government and the administration in the encourage- t of agriculture, and the best measures to be adopted in order to secure ss.

- **The Financial Measures of the Prussian Chamber of Agriculture.** — asures in *Volkswirtschaftliche Blätter*, Year XI, No. 10-11, pp. 135-138. Berlin, June 10, 1913.

In order to guarantee for the future the financial resources of the Ger- Chambers of Agriculture, the law of June 30, 1894, dealing with the hambers, accords to them the right of levying a certain tax upon the ultural properties of their district which are over a certain size.

§ 19 of the above mentioned law runs as follows:

"The total tax levied must, in general, not exceed one-half per cent. e net return of the land tax; only in extraordinary cases, and with the orisation of the Minister, may this figure be exceeded". This paragraph

TABLE I. — *Taxes levied by the Chambers of Agriculture.*

Districts	For the financial year 1903-04		Percentage of net return of land tax						For the financial year 1910-11	
	% of net return of land tax	Total £	1904-05	1905-06	1906-07	1907-08	1908-09	1909-10	% of net return of land tax	Total £
East Prussia	1/2	5 485	1/2	1/2	1/2	1/2	1/2	1/2	17/20	9 150
West Prussia	5/12	3 530	5/12	1/2	5/12	1/2	1/2	1/2	2/3	5 625
Brandenburg	4/10	6 524	4/10	4/10	2/5	7/10	17/20	17/20	1	17 007
Pomerania	1/2	6 705	1/2	1/2	1/2	1	1/2	2/3	2/3	8 906
Posen	1/2	4 826	1/2	1/2	1/2	1/2	1/2	1/2	3/4	7 073
Silesia	1/4	5 764	1/4	1/4	5/12	5/12	5/12	5/12	1/2	11 603
Saxony	1/3	8 443	2/5	2/5	2/5	2/5	1/2	1/2	1/2	12 849
Schleswig-Holstein	4/10	6 728	2/5	4/10	1/2	1/2	1/2	1/2	1/2	8 842
Hanover	1/3	7 396	1/3	1/2	1/2	1/2	1/2	1/2	7/10	15 540
Westphalia	4/10	5 156	1/2	1/2	1/2	1/2	1/2	1/2	1/2	6 392
Hess-Nassau	—	—	—	—	—	—	—	—	—	—
a) Cassel	1/2	2 717	1/2	1/2	2/3	2/3	2/3	2/3	2/3	3 613
b) Wiesbaden	5/8	2 068	5/8	5/8	5/8	3/4	3/4	7/8	1	3 358
The Rhine Province	1/2	8 384	1/2	1/2	1/2	1/2	3/4	3/4	3/4	12 516
Hohenzollern	—	195*	—	—	—	—	—	—	—	294
Total		73 922								122 768

nentions that the Chambers of Agriculture must publish an annual e sheet, and submit the latter to the Minister, while at the same time ıave complete autonomy in the management of their bank, and their keeping operations.

'able I, which is based upon the "Statistische Nachweisungen aus dem te der Landwirtschaftlichen Verwaltung von Preussen", shows how ; recent years the Chambers of Agriculture have used the power en- d to them.

'his table reveals a tendency to the progressive increase of the tax; in 1913 there were still seven out of the thirteen Chambers of Agriculture ssia which had not reached the legal limit of a levy of ½ per cent. on t return of the land-tax, and only one which had already over-stepped imit, in 1910 none of them had remained within the limit, and nine of had already, with the authorization of the Minister, passed it. The sum of the taxes collected by the Chambers of Agriculture was about)0 in 1903, and amounted in 1910 to about £ 120 000.

'able II shows the total expenses of the different budgets of the Chambers riculture since 1903.

ıfter a comparatively slight increase in the expenditure from 1903 to since the latter date there has been a regular increase of about £ 50 000 annual expenses of all the Chambers of Agriculture, since they rose from £420 000 in 1904 to about £700 000 in 1910. This increase is notice- in all the clauses of the budget, but especially in the one dealing the encouragement of forestry, which has risen from £3100 to £11200, ree or four times the original sum.

The chief increase in expenditure is furnished by the sections providing e encouragement of scientific work and instruction, and for the pro- n of stock breeding. These two sections alone represent the chief of the Chambers and account for over half their expenditure.

The progressive increase of the receipts corresponds, in some measure, at of the expenses. The receipts proper to the Chambers are by far the st and they have increased much more rapidly than the Government grants. ed, since 1903 the receipts proper of the Chambers of Agriculture have from £230 000 to £460 000, while during the same period the Govern- al grants have increased from £120 000 to £190 000.

As appears on comparison with Table I, the increase in the expenses er of the Chambers does not so much depend upon the increase of and-taxes (*i. e.* their more strict enforcement) as upon the larger receipts other sections of the Chambers (duties, school fees, sale of publica- , etc.).

The figures given show very clearly the extraordinary development of the of the Prussian Chambers of Agriculture.

TABLE II. — Budget

Financial Year	EXPENDITURE I For scientific objects and instruction	II For veterinary attendance	III For the encouragement of stock breeding	IV For the encouragement of fish breeding	V For the encouragement of forestry	
1	2	3	4	5	6	
	£	£	£	£	£	
1903 . . .	116 857	24 938	95 503	2 778	3 113	
1904 . . .	120 317	21 480	98 805	2 392	4 420	
1905 . . .	132 363	34 224	105 497	2 497	5 476	
1906 . . .	138 152	36 799	111 459	2 951	6 247	
1907 . . .	161 839	37 675	131 190	3 388	6 616	
1908 . . .	172 974	40 018	135 891	3 572	7 252	
1909 . . .	213 505	40 478	147 625	5 030	8 238	
1910 . . .	255 305	43 774	155 391	5 773	11 150	
In 1910 the "Verein für Landwirtschaft und Gewerbe" in Hohenzoll						
	632 ½		915	1 ½		

N. B. — The great increase in the figures in column 2 « Scientific objects and inst that the cost of periodicals and other publications of the Chambers was no longer instruction.

1130 – **Resolution of the Swedish Authorities on the Subject of the Future I tion of the Swedish Station for the Improvement of Seeds.** — *Sveriges desförenings Tidskrift*, pp. 142-223. 1913.

The Svalöf Station for the improvement of field crops, founded in by private initiative, has hitherto belonged to the Swedish Association the Improvement of Seed, notwithstanding the fact that the increa subventions granted by the State have rendered it more and more depen upon the Government. (1)

Owing to the always greater extension of its work and to the

(1) See Dr. HJALMAR NILSSON'S original article: « The Swedish Institute f Improvement of Field Crops at Svalöf », *B.* June 1913, pp. 834-843.

of Agriculture.

			RECEIPTS			
	VIII Administration of the Chambers	Total expenses	Total receipts	Government grants	Other grants from Provinces, ecc.	Receipts proper
	9	10	11	12	13	14
	£	£	£	£	£	£
6	77 771	403 465	399 823	123 628	39 796	236 399
1	75 779	414 255	417 829	131 775	38 844	247 210
8	92 350	459 871	455 373	138 647	39 631	277 095
0	97 115	508 519	508 343	146 476	43 195	318 672
4	126 227	585 242	572 040	162 068	49 561	360 412
6	112 144	625 276	616 015	182 355	55 284	378 377
8	112 692	655 456	659 633	179 678	56 530	423 425
4	90 049	703 775	697 804	187 492	56 427	453 885

l for the first time. It furnished the following figures:

6	163	1 952	1 899	1 471	15	413

large decrease in the administrative expenses (column 9) in 1910 are due to the fact istrative expenses, but to the fund for the promotion of scientific objects and

give the employees of the establishment a surer and more advantageous ition, a request for the increase of the subvention was made (the in- ase is so considerable that out of the total required revenue, estimated £7 414, the subvention alone figures for £4 950), and the question was ed whether the State should not take over the establishment as one of institutions.

This change was supported by the Royal Direction of Agriculture Landtbruksstyrelsen), which proposed however that the establishment uld be managed by a special board nominated by the King and consist- of seven members.

In order to ensure intimate cooperation with the Central Institute it the State possesses at Stockholm, in which other branches of agricul-

tural experimentation are carried out, it was proposed that two of the me
bers should be on the board of both of these institutions.

According to the measures proposed by the Government and approv
by Parliament, the establishment will continue to belong to the Swedi
Association for the Improvement of Seeds, in order that it may preser
that liberty of form which seems to have been so favourable to its develo
ment. The managing committee will consist of seven members, of whi
five will be nominated by the Government and two by the Association f
the Improvement of Seeds; a close cooperation with the State Centr
Institute will be obtained by means of two members belonging to bo
boards and by the discussions of the scientists of the two institutions.
laboratory will be installed for the chemical experiments required by th
establishment. The State subvention is fixed at £4 950 for the year 191
It is estimated that the Association that receives the improved seeds an
disposes of them commercially will give £2 200, while other sources of re
enue will yield £264.

In case the sum that the commercial association will have to pay a
cording to the agreement approved by the Government should exceed th
sum estimated in the budget, the excess will be put aside as an asset for t
budget of the following year, thus allowing the contribution of the State
be diminished.

1131 - **Agricultural Shows.**

Belgium.

1913. Nov. 8-10. Brussels. — Poultry show organized by the Brabançonne Club. Address
M. Pirard, Nivelles, or M. W. Collier, 97 Rue des Cailloux, Jette.

Nov. 8-10. Borgerhout (Antwerp). — National poultry show organized by the "Neerle
Society of Borgerhout. Address to the secretary: M. Eug. Dierkx, Chaussée de Tu
hout, 221, Borgerhout, Antwerp.

Nov. 15-17. Renaix (East Flanders). — International poultry show organized by
Pigeon Club. Address to the president: M. Otto Rose, Renaix.

Nov. 15-17. Charleroi. — International rabbit show organized by the "Cunicole Clu
of the Charleroi valley. Address to: M. Pévenasse (secretary of the club), Charle

Nov. 29-30. Ghent. — Annual international poultry show organized by the "Neerh
Poultry Society. Address to the secretary: M. A. Heyndrickx, 3 Rue du Saint Esp
Ghent.

Dec. 14-15. Mont-sur-Marchienne. — National poultry show organized by the "Ce
avicole et cunicole". Address to: M. Léopold Germain, Place du Wez, Mont-
Marchienne.

Dec. 20-22. Antwerp. — Eleventh international poultry show, organized by the "C
avicole anversais". Address to: 28, Rue Torfs, Antwerp.

1914. Feb. 7-9. Iseghem (West Flanders). — Fourth international poultry show organize
the "Hoenderbond 't Neerhof". Address to: M. Valère Laridon, Café Royal, Iseg

France.

1913. Nov. 12-16. Paris, Grand Palais. — International poultry show organized by the "So
Nationale d'Aviculture de France". This show will include fowls, ducks, geese
keys, rabbits, pigeons and dead poultry; there are a great many prizes in kinc
object of art offered by the President of the French Republic, money prizes
the Ministry of Agriculture and the General Council of the Seine, gold and s
medals, etc.

Jan. 17-19. Lille. — Fifteenth international poultry show organized by the "Les Aviculteurs du Nord" Society. Address to the general secretary: M. Emile Desreumaux, 92 Rue Franklin, Roubaix, Nord.

March. Nice. — General agricultural and horticultural show organized by the "Societé Centrale d'Agriculture et d'Horticulture". Address to the secretary: 113, Promenade des Anglais, Nice.

May - November. Lyons. — Permanent horticultural show, comprising: fruit-bearing and ornamental plants; instruments, machines and apparatus for use in the various branches of horticulture; plans, designs, books and publications on the subject. There will be three temporary shows of horticultural produce, as follows: June 5-9, Sept. 4-9; Nov. 21-27. Horticulturists and amateurs wishing to exhibit should make application in writing to the Mayor (M. le Maire de Lyon, Secrétariat de l'Exposition, Hôtel de Ville, Lyon), twenty days before the opening of each of the shows, indicating the number and nature of the exhibits and the space required.

Germany.

Oct. 22-23. Königsberg. — Sixty-first show and sale of live stock, organized by the "Ostpreussische Holländer Herdbuch-Gesellschaft". The catalogue of the animals shown may be obtained from the offices of the society: Beethovenstrasse 24-26, Königsberg i. Pr.

Nov. 22-23. Karlsruhe (Baden). — Rabbit show organized by the "Badenia" Rabbit Society..

May 5-7. Berlin. — Thirty-eighth Berlin Fat Stock Show.

German East Africa.

Daressalam. — General exhibition for German East Africa, organized by the Permanent Exhibition Committee for German Industries ("Standige Ausstellungs-Kommission für die deutsche Industrie"). Address: Berlin, N. W. 40, Roonstrasse 1.

United States of America.

Cattle shows and fairs:

Oct. 28 - Nov. 7. Jackson, Mississippi.

Nov. 3-8. Phoenix, Arizona.

Nov. 5-12. Shreveport, Louisiana.

Nov. 22-29. Fort Worth, Texas.

Horse shows and fairs:

Nov. 15-22. New York.

Nov. 24-29. Fort Worth, Texas.

Dec. 1-6. Chicago.

Agricultural Congresses.

United States of America.

Oct. 22.-Nov. 1. Tulsa (Oklahoma). — Eighth International Dry-Farming Congress. Applications for the report (costing one dollar) should be addressed to: Sir John Burns, Executive Secretary-Treasurer, International Dry-Farming Congress, Tulsa, Oklahoma.

CROPS AND CULTIVATION.

1133 - **On the Circulation of Sulphur and of Chlorine on the Earth, and the Importance of this Process in the Evolution of Soils and in the Vegetable World.** — Kossovitch, P. (Bureau for Agricultural Science of the Scientific Committee of the Central Administration for the Organization of the Land and Agriculture). in *Russisches Journal für Experimentelle Landwirtschaft*, Vol. XIV, No. 3, p. 181. German Edition, p. 218. St. Petersburg, 1913.

The writer treats specially the following subjects :

I. The chlorine and sulphur contents of rocks and soils

II. The quantities of chlorine and sulphur which are brought to the surface of the earth and to the soil by atmospheric precipitations.

III. The quantities of chlorine and sulphur that are washed out of the soil by subsoil waters.

IV. Part played by the chlorine and sulphur conveyed by the atmosphere in the evolution of the soil.

V. Chlorine and sulphur content and requirements of plants.

VI. General considerations on the circulation of chlorine and sulphur in nature.

Chapter I. — *The chlorine and sulphur contents of rocks and soils*

On the basis of analytical data, mostly taken from the existing literature on the subject, the writer comes to the following conclusions :

1) *Crystalline eruptive rocks* rarely contain more than 0.1 per cent. of chlorine ; the most widely spread rocks generally contain still less, in only traces. The amount of sulphur in the same rocks is higher than that of chlorine and often exceeds 0.1 per cent.

2) *In clastic and sedimentary rocks* chlorine in slightly soluble form is completely lacking ; it is present only in the form of easily soluble salts generally in traces.

3) *In soils*, chlorine in slightly soluble forms is not present ; the traces that have been observed are due to easily soluble salts. Sulphur is present in the soil in certain quantities in slightly soluble form, but they are not large ; according to available data, the total amount of sulphur in the soil is found in the humous layer, and is 0.04 per cent. corresponding to 0.1 per cent. of SO_3 ; in soils rich in humus, such as the Chernozem it reaches 0.1 per cent. The sulphur contents of the soil decrease considerably with the depth.

Chapter II. — *Chlorine and sulphur in atmospheric precipitations*

On the strength of material collected in eight localities of European Russia and of the data available for other countries, which are chiefly taken from N. H. J. Miller's treatise " The amounts of nitrogen as am

s nitric acid, and of chlorine in the rain-water collected at Roth-d" (*The Journal of Agricultural Science*, Vol. 1, Part 3), the writer es himself justified in drawing the following conclusions.

For Chlorine.

) The chlorine content of the several atmospheric precipitations varies erent parts of the world and within very wide limits: from 0.4 to er million. In the analyses made for Russia the lowest chlorine con-ound in one determination was 0.42 per million (Shatilov Experi-Station), the highest 58.11 (Borovoje Forest Experiment Station).

) The yearly averages of the chlorine content of atmospheric precipi-is varies in the different parts of the world within much narrower : from 1.46 per million (Konstatinov Meteorological Observatory in the bourhood of St. Petersburg) to 9.72 (Island of Ceylon), when Guardia in is not considered, in which locality the exceptionally high figure of 31.20 en recorded. For the localities in Russia which have been examined ifferences are still smaller, the lowest chlorine content (Konstanti-)bservatory) being 1.46 and the highest (Borovoje) 4.00. In general y be assumed that the atmospheric precipitation of the interior of a ranges in chlorine content between 2 and 3 per million.

) The amount of chlorine contained in the atmospheric precipitation ids chiefly on the position of the locality with regard to the seas and s; on approaching the latter the amount of chlorine increases. Also in is which border on salt lands the precipitations may be richer in chlorine. ally slight precipitations contain more chlorine than the heavier ones.

) The quantities of chlorine which fall in one year with the atmosphe-ecipitations per unit of area vary also very considerably in the various of the world. According to available data the lowest quantity of chlo-was observed at the Konstantinov Observatory, namely 7.09 lbs. per the highest at Guardia in Spain, 399.5 lbs. per acre. But the yearly sion of chlorine in most territories varies between 8.92 and 22.30 lbs. cre. Among the Russian localities examined the first place belongs is respect to the Forest Institute (near St. Petersburg) where each acre ved 14.98 lbs. of chlorine.

B. *Sulphuric Acid.*

) The lowest content in sulphuric acid per million parts of atmospheric pitation sank in the single determinations lower than the chlorine con-namely to 0.28 of SO_3 (Sapolje Experiment Station). The maximum was of SO_3 at the Forest Experiment Station at Marinpol.

The *yearly average* of sulphuric acid in the precipitation in the Russian nries that were investigated was 1.93 (Shatilov Experiment Station) and ighest 14.17 (Mariupol Forest Experiment Station). At localities within rea of influence of large cities, factories, railaways, etc., the amount of uric acid contained in the atmospheric precipitations has been deter-d by the writer to be above 10 parts per million, while in the country ies between 2 and 3.

2) The quantities of sulphuric acid per unit of area which fall to the ground the precipitations vary considerably in the localities examined. Places

which are not under the influence of chimney smoke get yearly about 8 kg of SO_3 per year. In the neighbourhood of towns and industrial works yearly amount reaches almost 72 lbs. In such localities the greatest tion of the sulphuric acid falls in winter. Thus, for instance, at Forest Institute one-third falls during the summer half-year and two-thi during the winter half. Localities in the country do not show much differe in the quantities that fall during the various seasons.

CHAPTER III. — *The quantities of chlorine and sulphur contained in subsoil waters.*

On the basis of theoretical speculations the writer gives the follow characters of subsoil water:

1) The percentage of chlorine and sulphur in the water in the soil subsoil is in general higher than that in atmospheric precipitations.

The general and fundamental cause of this greater percentage is evaporation, both directly from the soil and through vegetation, of a g of the water received as atmospheric precipitation.

2) As the ratio between the water that penetrates into the soil fi the atmosphere and that which evaporates varies between wide lim so do the relative chlorine and sulphur contents of soil and subsoil w vary greatly. In special cases these contents increase owing to a wi series of concurring causes.

3) The percentage of chlorine and sulphur in the soil water of any lo ity may, under certain conditions and when the amounts of these elem contained in the atmospheric precipitations are known, furnish data by m of which the evaporation of water from the soil or the relative quanti of soil water that are formed, may be determined.

4) The chlorine and sulphur content of the water in the soil va not only with the locality, but from year to year and from season to sea and changes in the course of years.

CHAPTER IV — *Part played by the chlorine and sulphur, which are conve by atmospheric precipitations, in the evolution of the soil.*

The writer considers exhaustively the two following questions: fir what length of time is necessary for the chlorine and sulphur of the at sphere to transform a soil into a salt soil when there is no formatio subsoil water; secondly what is the least quantity of subsoil water n sary in order to carry away all the chlorine and sulphur introduced the atmosphere. At the conclusion of the chapter the writer formu the following propositions:

1) As primitive rocks contain only small quantities of chlorine and phur, and these in the processes of weathering and soil forming are e transformed into soluble compounds and rapidly leached out, the nat

quence would be a relatively rapid impoverishment of the soil in two elements, until their complete disappearance took place. As r the development of plants is impossible in the absence of sulphur, continuous introduction of sulphur from the atmosphere a necessary ion for vegetation and for the evolution of the soil.

) In soils and subsoils in which, in connection with a dry climate, under- d waters are not formed, an accumulation of sulphur and chlorine due nospheric precipitation must take place. If it be assumed as an approx- on that the soil receives from the atmosphere only 4.46 lbs. of chlorine .46 lbs. of SO_3 per annum (which corresponds to about one-half of the est amounts of these substances which are received per acre and per n), the author calculates that it would take 12000 years to collect 0.5 ent. of each of these substances in a layer 3ft. 3 in. deep; in this t would be a decidedly salt soil which would contain about 1 per cent. orine and sulphur compounds But to render a soil too salty for most ated crops, which it becomes when it contains 0.05 per cent. of chlorine, years would be sufficient, and these from a geological point of view titute but a brief period.

) If, on the contrary, there is formation of subsoil waters, it requires quantities of them to leach out completely the chlorine and sulphur ounds conveyed to the soil by atmospheric precipitations. Thus the ities assumed above, namely 4.46 lbs. of chlorine and the same $_3$ would require about 720 cub. ft. of water per acre to leach them out .01 per cent. solution, which would be equal to a layer of water of about ches; consequently the formation of a relatively insignificant quantity bsoil water is sufficient to prevent an accumulation of chlorine and sul- compounds in the soil.

CHAPTER V. — *Quantities of chlorine and sulphur contained in and required by plants.*

he writer discusses these points principally in connection with ur. On the strength of the available Russian and North American es the following conclusions are arrived at:

) Determinations of sulphur content carried out with all due precautions plants themselves, not on the ash, show that cultivated crops are rely rich in this element: in some of them, such as cabbage, turnips nions, the sulphur content is higher than the content in phosphorus. ber plants, for instance red clover, lucerne and sugar beets the two nts are present in equal quantities; cereals especially are poor in ur, containing about twice as much phosphorus as sulphur.

) According to the above data, the sulphur content, expressed as SO_3 ferred to air dry matter, ranges in the grain of cereals from 0.29 to 0.45 nt., in straw between 0.26 and 0.55 per cent. Clover hay contains ber cent. of SO_3, lucerne hay 0.50 per cent. Peas contain 45 per cent. (*Phaseolus*) 0.58 and soy beans 0.85. In some crucifers the sulphur

content exceeds 1 per cent.: in turnips it is 1.85 and in cabbage 2.05 per cent. of SO_3.

3) The quantities of sulphur which are removed by average crops an acre maynbe expressed by the following figures: for cereals 6.25 to lbs, of SO_3 (in crop of 1338 lbs. of grain and 1962 lbs. of straw per a for red clover 16.06 lbs. (4014 lbs, of hay); for lucerne 26.76 lbs. (53.5 of hay); sugar beets about 44.6 lbs and cabbage 65.13 lbs. (in a cr 3212 lbs).

4) The sulphur derived from atmospheric precipitationsis sufficie satisfy the wants of relatively abundant crops of cereals only, but on cond that there be no leaching out of sulphur; for if there is any such loss cultivation of such plants unless accompanied by appropriate manu will gradually lead to a shortage of sulphur and the crops will dim until an equilibrium gets established bewoeen the sulphur brough the atmosphere and that taken up by the plants and leached out by soil water.

5) On the other hand, in localities situated near towns and indus centres, the wants of such plants as are most exacting in their sul requirements can be completely satisfied by the quantities furnished b atmosphere. In making and judging experiments on the requiremen sulphur in the soil the above mentioned great differences in the amoun sulphur given up by the atmosphere according to locality must be taken account. This especially in treating the question of soil sickness in nection with clover and in dressing clover with gypsum.

6) The reserves of sulphur in the soil cannot be considered as being l in comparison with the requirements of plants as to this element. An a age sulphur content of the soil (in the upper layer one foot deep 0.1 per SO_3, in the next 2 ft. 3 in. 0.025 per cent.) amounts to about 5085 per acre in a layer 3ft 3 in. deep; one half of this amount corresp to 285 cereal crops or 70 lucerne crops.

All the preceding data and considerations show that in certain c an impoverishment of the soil as to sulphur and a shortage of this elemen the nutrition of plants is possible, and consequently that sometimes i succession of heavy crops the introduction of sulphur by means of suit manuring becomes necessary.

CHAPTER IV. — *General considerations. On the circulation of chlorine and sulphur on the globe.*

It is specially emphasized that at present the circulation of chlo con sists chiefly in a mechanical transport between the land, the seas, the atmosphere, and in the form of that simple combination in w chlorine is prevalently found.

The circulation of sulphur is considerably more complicated: o one hand sulphur is subject to a continuous passing from an inorgan an organic form and vice-versa, on the other it undergoes oxidation reduction processes in most of which micro-organisms take part.

The Condition of Soil Phosphoric Acid Insoluble in Hydrochloric Acid. — W. H. (Scientist in Soil Laboratory Investigations, Bureau of Soils, U. S. Department of Agriculture), in *The Journal of Industrial and Engineering Chemistry*, l. 5, No. 8, pp. 664-665. Easton, Pa., August 1913.

he official method for the analysis of soils is accomplished by digesting known quantity (10 grams) of the soil in hydrochloric acid, specific y 1.115, for ten hours on a steam or water bath, and then analysing lution thus obtained for the constituents which it is desired to determine. This method does not invariably give the total amount of phosphoric resent in the soil analysed. The writer gives the values obtained in idy of the chemical composition of Maryland soils ; the average per- e of phosphoric acid extracted was about 57.6 per cent. In the same ra series of Virginia soils, in every case except one, gave less amounts sphoric acid than the total amount obtained by the fusion method. here are two explanations for this :

a) The phosphoric acid not extracted by the official method is present the soil in compounds insoluble in the acid used.

b) It is present in a soluble from which it is protected from the action acid.

Ve have no means of directly testing the first of these possibilities. l mineral phosphates have, however, been found which their finders re insoluble in hydrochloric acid. None of these insoluble phosphates er have been discovered in the soils examined by the Soil Bureau ; r do exist in them the quantity present must be extremely small. r the amount of insoluble phosphoric acid present in minerals which carry the former as an essential ingredient, or which is present in orms derived from the interaction in the soil solution, must be very ndeed.

regard to the second possible explanation, mineralogical analyses hown that a very large number of soils contain apatite, a hydrochloric luble calcium phosphate, enclosed in quartz grains. Such soils ubjected to acid digestion, and the apatite was found still inclosed rtz, and apparently unattacked.

conclusion, it may be said that possibly a very minute quantity of oric acid is present in soils in compounds which are insoluble in hloric acid, but a large part of the phosphoric acid not extracted is in a soluble form, *i. e.*, as apatite, which is protected from the of the acid.

The Question of the Inoculation of New Crops on Moor Soil. — RAMM, E. *Illustrierte Landwirtshaftlichc Zeitung*, Year 33, No, 66, p. 597, 1 fig. Berlin, ust 16, 1913.

e inoculation of new crops on moor (1) soil, whether by means of inoil or of pure cultures, is a matter of much difficulty when it is a ques-

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We translate the German "Hochmoor" as "moor", and "Niedermoor" as cf. TANSLEY: "Types of British Vegetation", pp. 208-213.

(*Ed.*)

tion of thus treating hundreds of acres. For this reason, attempts l for many years been made on the State farm in the Wiesmoor to substi a dressing of nitrate of soda (180 lbs. per acre) for inoculation. Th tempt has been most successful: the crops grew well right from the and developed in a thoroughly satisfactory manner.

From this time, all new crops in the Wiesmoor have been thus prepa the results have been uniformly successful and no interruptions in the c vation operations have occurred. In 8 to 14 days after germination, roots of the clovers and other Leguminous plants show plenty of nitroge nodules.

On areas which have not been inoculated or manured with nit the root nodules do not make their appearance until much later, gene not until about eight weeks have elapsed. Further, the crop, as a shows gaps which only fill up after some time.

It should be the task of science to ascertain the source of the bact which, on the application of nitrogenous manure, produce such a ge and regular crop of nodules on the roots, and to account for the incre bacterial receptivity possessed by plants with nitrogenous manuring.

The practical results of the experiments on the Wiesmoor show where new crops must be sown throughout the spring and summer, a n genous manure is less troublesome and much more certain in its effects inoculation; thus the application of easily soluble nitrogen is preferable an economic stand-point. With a nitrogenous manure, the success of newly-sown crops can be more surely reckoned upon, while there are failures in the case of inoculation. The areas receiving the nitroge manure develop so well that the cost of the fertilizer is paid by tur the sowing year to account. If the greater certainty is taken into sideration, a nitrogenous manure is also cheaper than inoculation. Fur experiments should show how far the above-mentioned results are affe by the application of nitrate of soda in larger or smaller amounts than 180 lbs. per acre employed in this case.

1136 – **Experiments on Denitrification.** — TCHIRIKOV TH. and SCHOAUCK, A. in. *stia Moskovskago Selskokhoziaistvennago Instituta*, Year XIX, Part 2, pp. 270-285 Moscow, 1913.

Three series of experiments on denitrification conducted at the Agr mic Institute at Moscow.

I. *Influence of moisture on the course of denitrification in the presen straw in progressive doses.* — Experiments carried out in sandy loam soil different degrees of moisture: 40, 60, 80 per cent. of the water capa of the soil. The results obtained were the following:

1. Oats both without straw and in doses of 0.25 to 1 per cent. of the in pots. developed best with 80 per cent. of moisture.

2. A diminution in the yield of oats was observed with increa doses of straw and this with various degrees of moisture.

3. This diminution of yield took place more rapidly with 80 per cen moisture; with less moisture it was less intense.

4. In general an increase in the degree of moisture favours the depress- influence of the straw both on nitrate of soda and on sulphate of ammonia.
5. The decrease of yield caused by the application of 0.25 per cent. of w is equivalent to that caused by a reduction of the degree of moisture o per cent.

II. *Addition of carbonate of lime in the presence of straw.* — The addition of onate of lime diminishes the depressing effects of straw considerably t completely. The favourable effects of carbonate of lime are already eable with a dose of 0.25 per cent. of the earth; but on increasing the dose per cent. there was no further increase of yield.

III. *Action of sugar starch and straw.* — Experiments of cultivation nd with additions of sugar, starch and straw, in doses of $^1/_8$ to 1 per cent. e sand. The plants grown (oats and mustard) developed least with r, next came starch and straw. As for the balance of nitrogen the writers the following principal observations:

1. The depressing action on plants caused by the addition of the above ioned substances is not due to a real denitrification.
2. The nitric nitrogen of the soil gets converted into albuminoid bodies, depriving the plants of a considerable part of the assimilable nitrogen.
3. The percentage of nitrogen in plants is the greater the more their opment is depressed.
4. The addition of organic substances in the presence of nitrates causes roduction of an alkaline medium and in direct ratio to the quantities yed.

Irrigation Resources in California and their Utilization. — ADAMS, F. der the direction of FORTIER, S.) — *U. S. Department of Agriculture, Office of periment Stations, Bulletin* 254, pp. 95, 9 maps. Washington, June 1913.

or many years the United States Geological Survey has been mapping aphy, measuring streams, and studying underground waters in Cali- and engineers of the Reclamation Service have been looking for pos- evelopments of unreclaimed land. In 1910 the Office of Experiment as directed an irrigation census of California, and in 1912 the Con- ion Commission of California published three full reports dealing with rn, Central, and Southern California respectively and the irrigable f each section, together with discussions of water supplies, their use, and estimates of future possibilities. The present Bulletin rises these and records the results of a further series of field investi- made by the Office of Experiment Stations in cooperation with the vation Commission during the year 1912.

igation is not equally necessary in all parts of California, neither can essity for it be predicted from the annual rainfall. If grain were y crop grown, but little irrigation would be required in the coastal or of the interior valleys of the northern half of the State. Below ncisco the necessity would increase, becoming absolute in the lower aquin Valley and most of the State south of Tehachapi. But even orthern part of the State the rainfall occurs almost entirely during

the winter, which is the growing period, and during the rainless sum few plants can be grown without an artificial water supply, so that ir tion during the latter season is a distinct advantage in nearly every sec of the State.

Northern California, or that portion of the State north of San Franc is divided into six irrigation zones: the coastal zone, the moun valleys to the north, the mountain valleys to the east, a zone of high teaus and valleys in the north-eastern corner of the State, the Sierra foot on the western slope of the Sierra range, and the Sacramento Valley. present extent of irrigated land and possible future developments are mated as follows.

	Agricultural land — acres	Irrigated at present — acres	Total to be irri — acre
Coastal counties	502 200	2 675	10
North-central mountain valleys	435 000	103 850	25
North-eastern plateaus and valleys	867 000	161 930	30
Feather River valleys (mountain valleys)	158 000	50 600	10
Sierra foothills	789 000	45 250	20
Sacramento valley	3 449 000	123 500	2 50
Total	6 200 200	487 805	3 45
	100	7·9	

In a general way it may be said that the irrigated land in Nor California forms but a small percentage of the agricultural land and a very abundant water supply which is used in a wasteful fashion used to the best advantage and with suitable storage, etc., the water res of this section should be sufficient to increase the irrigated area 7·9 to 55.6 per cent. of the agricultural land.

Central California, or that part of the State south of San Francis north of Tehachapi, is divided into four irrigation zones: the coastal z the large central valley of San Joaquin, the Sierra foothills on the w slope of the Sierra range and a high zone east of the Sierra range. Th cultural areas irrigated at present or liable to future development follows:

	Agricultural land	Irrigated at present	Total area to be eventually irrigated
	acres	acres	acres
al Valley	887 000	82 000	200 000
oaquin Valley	7 576 000	1 728 975	3 850 000
foothills	730 000	10 620	50 000
east of the Sierra	472 000	137 760	200 000
Total	9 665 000	1 959 355	4 300 000
	100	20.3	44.5

In the coastal valley the water is not abundant and is further reduced the fact that the cities take a heavy toll. Already one-third of the ter used there for irrigation is pumped, and as valuable crops can be n when water is available, considerable expense may be incurred ler to obtain it. On the whole, good use is made of the water supplies ntral California, and future development will only take place by prac- the strictest water economy and, in the case of the coastal valley, by ing the underground resources. In the high zone east of the Sierra ıla the available water supply will be tapped by the Los Angeles aque- now under construction, which will divert 430 cubic feet per second for n and about Los Angeles.

Southern California, or that part of the State south of Santa Barbara the Tehachapi Mountains, is divided into six irrigation zones, four of h are more or less coastal, the two others being the Colorado and Mojave rts:

With regard to the coastal zones, Santa Barbara and Ventura Counties e not, up to the present, utilized their water resources as completely ther parts of Southern California, and the surface flow together with lerground supplies might serve to increase the irrigated area 6 ½ times. elopment in the Los Angeles and San Gabriel River zone will depend ıaly on the Los Angeles aqueduct, and in the two other coastal zones no developments are likely to take place, as the supplies are already well ed. In the desert zones, the luxuriance of plant growth under irri- is inevitably bringing about development, though the water resources mited. Increased supplies will come in part from the Colorado River n part from underground supplies.

Summarising: "The total area of irrigable land found in the zones of ıtion water supplies, which includes all of the valley lands, the rolling ıs of the Great Valley, the arable portions of the Sierra foothills up to t 3000 feet in elevation, and all of the plateau and desert lands to which

	Agricultural land — acres	Irrigated at present — acres	Total area to be eventually irrigated — acres
Santa Barbara and Ventura Counties . . .	509 250	49 656	322 5
Los Angeles and San Gabriel River lands .	441 986	167 454	381 5
Santa Anna River lands	876 671	213 407	279 0
San Diego County	363 668	19 880	87 1
Colorado Desert and River Valleys	1 550 750	279 600	766 5
Mojave Desert	2 328 000	15 489	113 0
Total . . .	6 070 325	745 486	1 949 6
	100	12.3	32

some irrigation water supplies are available, is 21 935 500 acres, of wh 3 192 646 acres are already irrigated, and 9 699 600 acres are estimated the area to be ultimately irrigated. "

The writer states that the results given above are largely statist so that the estimates of areas ultimately to be irrigated can only be approximative. The 1912 investigation dealt chiefly with a detailed st of six typical irrigated areas which are fully described in the Bulletin. writer repeatedly urges the absolute necessity of a general State contr all water supplies, for in that manner only can they be put to the best and lead to a maximum development of agriculture in California.

1138 – **The Murrumbidgee Irrigation Scheme in New South Wales.** – *Jo of the Royal Society of Arts*, Vol. LXI, No. 3168, pp. 873-875. London, August 8,

The soil of the so-called "chocolate" lands in the western par New South Wales is extremely fertile, but up to the present owing to sufficient rainfall, the land has only been used for grazing sheep and cat As the outcome of the work of a Royal Commission, appointed thirty y ago, the State Government has begun work on a gigantic irrigation sch in the Murrumbidgee River basin.

The waters of the Murrumbidgee are derived from the lofty table la in the Eastern part of the colony where the rainfall amounts to from to 70 in. per annum; the chief gathering ground is a basin 5 000 sq. m in extent with only one outlet to the lower country through a deep g at a place called Burrinjuick. With a suitable dam here the most pe natural reservoir is obtained, backing up the river for 41 miles and two

ant tributaries for 15 and 20 miles respectively, and forming a lake
an area of 29 square miles. "The dam is of Cyclopean concrete, 240 ft.
at its maximum section, and 18ft. wide at the top. The up-stream
is nearly vertical, being slightly battened down to the base. The down-
am face shows a curve concave to the down-stream to 60 ft. below the
t, so as to make the dam 36 ft. thick at that point. Then there is a
e of 1 ½ to 1 for a depth of 90 ft., at which point the dam is 90 ft. thick
n follows another curve in the same direction, for 50 ft. vertical, to a
d 40 ft. above the base. From this point the face is vertical, and finishes
76 ft. from the inner toe of the foundation. In plan the dam will be
ft. in length along the crest, which is curved convex to up-stream to a
ius of 1200 ft. The wall is being built up in a series of units, each
resenting the average quantity of concrete that can be placed in one
These units break joint in every direction, so as to imitate masonry
struction and minimise defects due to remission of work."

The outlets consist of four 4 ft. 6 in. pipes, passing through the dam
the foundation, and controlled by valves, and two byewashes at the
one at each side of the dam. The sides and bed of the gorge are of
nite, and blocks of this are used for the concrete; sand is also obtained
by. The granite floor is irregular, so that the concrete masses key
the holes, thus preventing any possible movement under the pressure
the water.

The estimated cost of the dam, notwithstanding the high price of the
, comes to about £750 000, which is roughly equivalent to £1 per
oot of water held back; this is believed to be much less than the cost
similar work elsewhere; the Assuan dam, which holds up a maximum
of 75 ft. of water, as against 230 ft. at Burrinjuick, cost £2 7s. per
oot of stored water.

For 220 miles below Burrinjuick irrigation is not required; then a
dike at Berembed, near Narandera, forms a convenient point for the
sion of the river. The main irrigation channel is 132 miles long and
134-mile branch, as well as distributing channels, and will serve to irri-
a block of land of 1 300 000 acres. At the point of diversion, a flow
000 cubic feet of water per second will be available. The main irri-
n canal is 64ft. wide at the water-level with a flow 8ft. deep, equal to
esent discharge of 1000 cubic ft. per second; this capacity will even-
y be doubled. Distributing canals carry the water to each separate
ing. Most of the farms on the area are designed for mixed farming
comprise 30 acres of irrigable land. Some, however, are smaller, while
icultural and workmen's blocks are narrowed down to 10 and 2 acres
ectively.

The irrigation settlement will include three towns, about 400 miles
from Sydney. These will be planned on modern lines, and will be
vided with factories for the utilization of the produce. Roads will be
nged in such a way that no landowner will be more than a mile and a
from one.

The soils in the Murrumbidgee Valley are suited for irrigation, bei loamy, deep, rich and friable. The natural drainage is such as to preclu any necessity for an artificial system. Analyses show that the soils conta an exceptional proportion of potash, and nodular limestone is abundan The soil displays great bacteriological activity with rapid and vigoro nitrification. Mineral plant food is abundantly present.

All the land within the irrigation area is leasehold, and the lessees ha to conform to conditions and regulations that are more or less inseparal from an undertaking that needs more co-operation than among the settl in more ordinary circumstances. The conditions to be fulfilled are per tual residence, payment of rent and balance of survey fees, and for value improvements, if any, on the land when applied for. The rent is at the ra of 2 ½ per cent. per annum on the capital value. Farms are not transf able, with certain exceptions, until 5 years' residence has been complet

As to the cost of water to the settler, it is fixed at 5s per acre-f during the summer ; this water rate is to be reduced by one half during t settler's first year of occupation, then increasing uniformly until the six year, when the 5s rate is required. The operations of farming on the a have now fairly started, and a certain amount of produce has been s away to market.

The cost of the present scheme in round figures is approximately follows : main works, £ 1 650 000 ; subsidiary channels, £650 0000 ; cost land, £ 1 000 000 ; total cost £ 3 300 000.

1139 – **Comparative Manuring Experiments with Crushed Phonolite and 40 cent. Potash Salts.** — WAGNER, F. Düngungsversuche des Deutschen Hopfbauve mit Phonolithmehl (Kalisilikat) in Vergleich zu 40 % igem Kalisalz in den Ja 1910-1912. — *Praktische Blätter für Pflanzenbau und Pflanzenschutz*, Year XI, Pa 5, 6, pp. 52-53, 67-70, 77-82. Stuttgart, April-May-June 1913.

An account of three year experiments (1910-11-12) carried out at Gei feld, Bavaria, by the German Hop-Growers' Association ("Deutsches H fenbauverein") at Geisenfeld, Bavaria. The hop garden which was site of the experiments was planted in 1908; the soil was humous sand(per cent. of fine soil), infertile and poor in potash (0.107 per cent. K_2 air-dried fine soil). To a basis of sulphate of ammonia, basic slag and were added, for comparative purposes, the crushed phonolite prepare the "Westdeutsche Eisenbahngesellschaft, Köln, Abteilung Steinbri Brohl am Rhein", and 40 per cent. potash salts. The crops of and 1911 were failures owing to reasons unconnected with the experim

In 1912 the experiments were recommenced on eighteen plots; in tw there were 4 rows of 20 hills, and in six there were 4 rows of 10 hills. hill, received 100 gms. (3 ½ oz.) of sulphate of ammonia, 150 gms. (of basic slag (at 18 per cent. P_2O_5), and 100 gms. (3 ½ oz.) of lime as dressing. The potash manure was applied as follows.

Plots 1, 7, 13: 284 gms. of phonolite at 9.87 per cent. potash = 28 gms. K_2O
" 2, 8, 14: without potash
" 3, 9, 15: 60 gms. potash salts at 46.84 per cent. potash = 28 gms. "
" 4, 10, 16: 142 gms. of phonolite = 14 " "
" 5, 11, 17: without potash
" 6, 12, 18: 30 gms. of potash salts = 14 " "

Reduced to acres, the results obtained in 1912 are from the financial point of view as shown in Table I.

TABLE I.

Amount of potash	Increase in crop due to the potash manure	Profit (hops at 74s 6d per cwt.)	Cost of manure and of picking and drying extra crop	Net profit due to the potash manure
	cwt.	£ s	£ s	£ s
lbs. as potash salts (2 oz. per hill) at 9d per unit.	6.1	22 14	8 2	14 12
lbs. id. (1 oz. per hill) id.	3.7	13 17	4 17	9 0
lbs. as phonolite (10 oz. per hill) at per unit.	2.0	7 6	3 4	4 2
lbs. id. (5 oz. per hill) id.	0.7	2 15	1 6	1 9

The data respecting the quality of the hops in 1912 are given in Table II.

TABLE II.

Potash manure	Points for appearance, lupulin and aroma (3—15)	Commercial value	
		relative (minimum = 100)	absolute (per cwt.)
lbs. of potash as phonolite	9.25	101.0	105s
" " potash salt	9.75	102.5	106s 6d
" " phonolite	9.00	101.5	106s 6d
" " potash salt	10.00	105.0	109s
. . . . .	9.75	104.3	109s

1140 – **The Sulphur Industry and Trade in the United States.** — PHALEN, W (U. S. Geological Survey) Sulphur Pyrite and Sulphuric Acid. — *The American ...ilities*, Vol. XXXIX, No. 3, pp. 41-56 (41-47) Philadelphia, August 9, 1913.

The production of sulphur in the United States since 1880 is shown the following table.

Production of sulphur in the United States, 1880-1912 in long tons.

Year	Quantity	Value $
1880	536	21 000
1881	536	21 000
1882	536	21 000
1883	893	27 000
1884	446	12 000
1885	638	17 875
1886	2 232	75 000
1887	2 679	100 000
1888	—	—
1889	402	7 850
1890	—	—
1891	1 071	39 600
1892	2 400	80 640
1893	1 071	42 000
1894	446	20 000
1895	1 607	42 000
1896	4 696	87 200
1897	2 031	45 590
1898	1 071	32 960
1899	4 313	107 500
1900	3 147	88 100
1901	241 691*	1 257 879
1902	207 874*	947 089
1903	233 127*	1 109 818
1904	127 292	2 663 760
1905	181 677	3 706 560
1906	294 153	5 096 678
1907	293 106	5 142 850
1908	369 444	6 668 215
1909	239 312	4 432 066
1910	255 534	4 605 112
1911	265 664	4 787 049
1912	303 472	5 256 422

* Including the production of pyrite.

In determining the value of most of the sulphur produced in 191 current market price in New York was taken and the mine values computed from it. Prices remained fairly constant throughout the at $ 22 to 22.50 per long ton for prime Louisiana sulphur.

Quotations on other sulphur per 100 *lbs.*

	$	$
Rolled sulphur	1.85 to	2.15
Flour »	2.00 »	2.40
Sublimed »	2.20 »	2.60

Sulphur was produced chiefly in Louisiana, and in smaller quantities evada and Wyoming in 1912. The production of the individual States ot be given without divulging confidential information. Utah, which produced on a small scale in previous years, reported no output in 1912.

Trade. Imports and Exports. — The imports of sulphur during the five years are shown in the following table:

Sulphur imported and entered for consumption in the United States from 1908 *to* 1912, *in long tons*

ar	Crude		Flowers of sulphur		Refined		All other		Total Value
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	
		$		$		$		$	$
. . .	19 620	318 577	793	22 562	693	17 227	30	4 013	362 379
. . .	28 800	492 962	770	23 084	966	26 021	53	7 565	549 632
. . .	28 656	496 073	1 024	30 180	1 106	25 869	47	6 489	558 611
. . .	24 200	434 796	3 891	83 491	985	24 906	68	9 643	552 836
. . .	26 885	494 778	1 311	39 126	1 665	40 933	66	9 137	583 974

Crude sulphur imported from the following countries, from 1910 *to* 1912, *in long tons.*

ntries whence exported	1910		1911		1912	
	Quantity	Value	Quantity	Value	Quantity	Value
		$		$		$
ia.	5	160	—	—	—	—
d Kingdom	7	199	11	248	—	—
. . . . .	10 704	201 993	8 031	156 157	2 348	46 003
n.	17 377	283 232	16 185	279 991	24 505	447 946
r countries	554	10 404	23	329	32	829

The exports during the last three years were as follows:

Total exports of sulphur from the United States from 1910 to 1912, in long tons.

Year	Quantity	Value
		$
1910	30 742	552 941
1911	28 103	545 420
1912	57 736	1 076 414

It is to be noted that in 1910 the sulphur production of the United Sta amounted to 3147 tons; the imports during that year were 167 696 tons which 166 285 were crude sulphur chiefly from Sicily. Thus the dome production amounted to 1.84 per cent. of the sulphur consumed during t year, while in 1912 against a domestic production of 303 472 tons the i ports amounted only to 29 927 tons, the domestic production constitut 91 per cent. of the consumption, and the imports less than 9 per cent. Mo over in the same year the excess of exports over imports amounted to 2 tons and the balance of trade in favour of the United States was $ 49 The imports from Italy were only 8.7 per cent. of the total, while those Japan amounted to 91 per cent. For the year 1912 it is estimated tha output of that country cannot be far from 40 000 tons, and it is bel that with the completion of the Panama Canal, United States sulphur practically displace foreign sulphur on the Pacific Coast (California,

Further development. — Some new factors of the American sul industry are the foreign expansion of the Union Sulphur Co. of Loui and the new sulphur mines in Texas and in Wyoming.

The Union Sulphur Co. is reported to have negotiated with the cit thorities of Rotterdam (Holland) for the leasing for twenty-five years suitable tract of land having access to one of the harbours upon whi build a sulphur mill and other buildings. The city has offered a tra land 330 × 420 feet with dock facilities on the Maas Haen, for whi annual rental of $ 4200 is asked. The firm contemplates making Rc dam its headquarters in Europe, and already a new refinery with gri and storage facilities is being built. During 1912 the company is st to have acquired storage facilities at Hamburg (Germany). Besides recent additions to its European distributing centres the company ha fineries and storage plants at Marseilles and Cette in France. These p will be supplied by the company's own fleet of ships, to which two ve were added in 1912.

In 1909 and 1911 the occurrence of suphur near Bryan Heights at mouth of Brazos River, in Brazoria County, Texas, was reported. A

g operations however were not begun till November 1912 by the Free-Sulphur Co. The work has been somewhat intermittent owing to ilties inherent in the beginning of an operation of this kind.
The sulphur is to be obtained by a process similar to that employed in iana, that is the sulphur is melted in the ground by superheated water s pumped to the surface by an air lift. Up to the middle of February seven wells had been sunk.
Bryan Heights is well located for the exploitation of the sulphur. It is 3½ miles from the Freeport harbour. The detailed results of the g operations have not yet been published, but it is reported that ulphur deposit was found at a depth varying between 900 aud 1100 The sulphur beds themselves ranged in thickness from a few inches 7 feet. Fuel oil will be used in the machines for raising the sulphur and l can be delivered at Freeport at a low cost.
Other sulphur deposits have been found in Wyoming, but it is still ful whether they can be utilized unless the local demand becomes

astly the deposits of sulphur situated on White Island in the Bay of y, New Zealand may, prove of interest for the markets of the Pacific. began on these deposits in April 1912 and the tonnage of sulphur ated in them is very large.

- Experiments on the Availability of Glucosamine Hydrochloride as a ource of Nitrogen for the Nutrition of Corn *(Zea Mays)* and Beans *(Phaseolus multiflorus)*. — HAMLIN, M. L. in *The Journal of the American Chemical ociety*, Vol. XXXV, No. 8, pp 1046-1049. Easton, Pa., August 1913.
Two sets of experiments were carried out with 46 and 24 plants respec-y, and showed that glucosamine could not be utilized as a source of gen in plant nutrition, owing either directly to its own characteristics, lirectly to conditions it may have caused, such as the growth of some ld which frequently appeared in the glucosamine solutions.

- New Selection Varieties from Alpine Forms of Fodder Grasses. — VON WEIN-ZIERL, TH. in *Zeitschrift für das Landwirtschaftliche Versuchswesen in Oesterreich*, Year XVI, Part 7, pp. 790-820, 2 figs., 10 plates. Vienna, July 1913.

I. INFLUENCE OF THE ALPINE CLIMATE ON PASTURE GRASSES.

Specific alpine plants show a number of the most varied and characteristic morphological and physiological modifications, which are to be butted primarily to the effect of the alpine climate, and according to . Naegeli should be regarded as " adaptation characters", in distinction ifferences in organic characters which are not directly connected with ptation to special circumstances, and are more constant.
The writer has for many years been carrying on experiments and studies he Sandlingalp in the Northern Alps, at an altitude of 1400 m. (4700 ft.); e have shown that on the whole a number of the most valuable and ortant species of pasture grasses from the plains, and especially the wild

forms from higher ground, when grown under alpine conditions, gradu give rise to other forms differing in morphological and physiological cha ters from their valley-bred ancestors. The most interesting point, and one of greatest value from the agricultural standpoint, is that by m of continued selection, bearing on the most important characters for fo plants (resistance to cold, yield of fodder, tillering, early development, these characters may be further intensified and prove constant under al conditions (sub-alpine vegetation region) even after 20 years' cultivat in this way new varieties of these cultivated plants may be raised.

When it is also taken into consideration that many of the parent pl dating from 1891 which have undergone this gradual transformation still growing in the experiment garden on the Sandlingalp, it appears t writer that his selection experiments with Gramineae may be regarded further and conclusive proof of the truth of the theory advanced Lamarck and upheld by C. von Naegeli, that environment has a d effect upon the individual plant and that modifications arising thr direct environmental influence are transmissible.

The persistence and transmission of these acquired characters has tainly resulted in all the forms of Gramineae obtained by the writer thr selection; party through mass selection and partly through line sele based on special forms and qualities.

The yearly increasing deviations in all the species and varieties co ted in the appearance of purple colour on the nodes, the leaf-sheaths and flowering glumes, and then in the increasing production of sterile (shoots) and enhanced tillering generally (Bestockungszahl) (1) ,larger n ber of leaves, increased breadth of the leaves, shortening of the interno also in the formation of special means of protection, as the waxy coveri cocksfoot (*Dactylis glomerata*) and *Sanguisorba dodecandra*, the reducti serration of the leaves (*Bromus erectus* and *Deschampsia caespitosa*), finally a reduction of the vegetative period and displacement of the ph logical phases in general.

In order to ascertain as far as possible the relations of the clir influence to these alterations in the alpine grass forms, the most impor factors of the alpine, climate, *viz.* temperature, insolation, humidity o air, rainfall, and the chemical light intensity, were observed regularly ing the vegetative period, and it was found that certain direct adapta depend partly on single and partly on combined climatic factors.

It can be affirmed now that without doubt, chemical light inten plays a very important part among the climatic factors of alpine distr and that it directs the formative process of certain organisms of espec variable species, at all events during the earliest stage of their developm giving the impetus to the characteristic laying down and the later sha of the leaves and stem, that is of the sheath and blade in the one case,

(1) The writer understands by this the number of sterile shoots to every culm o individual plant. Translated lower down as " tillering value ".

nternodes in the other. The shortening of the latter leads necessarily more tufted habit, owing to the side shoots being thereby brought r to the main stem; this is shown by most Gramineae cultivated under fluence of the alpine climate.

THE MOST IMPORTANT ALPINE VARIETIES SELECTED FROM PLANTS FROM THE PLAIN.

The writer has bred the following new varieties:

. *Agropyrum caninum* Schreb.: a variety bred from the wild form of lain; it resembles Italian ryegrass, but is a persistent fodder grass (espe- adapted for alpine green soiling mixtures and alpine meadows).

. *Arrhenatherum elatius* Mert. et Koch: very suitable for alpine mea- : selected from wild forms.

. *Arrhenatherum* var. *bulbosum* Koch: a variety well adapted for alpine ows, selected from wild forms.

. *Avena pubescens*. Huds: persistent, leafy variety, bred from wild nd forms.

. *Dactylis glomerata* L.: alpine form with bloom-covered leaves; de- ed from wild mountain plants; resistant to rain (ombrophilous).

. *Festuca arundinacea* Schreb.: alpine form with the typical charac- cold resistant even at high altitutes; leaves soft; very productive, ially suitable for alpine meadows.

. *Festuca pratensis* Huds.: from wild plants, coming from mountain ows; a very productive and persistent alpine selected variety.

. *Festuca rubra* var. *fallax* Hack.: from this tufted variety of *Festuca* , an alpine form was bred with purple nodes and variegated outer ; it has soft culms and narrow leaves, is cold-resistant and very produc-

. *Lolium perenne* L.: a persistent alpine form with purple nodes, and l, purplish leaf-sheaths; selected from wild individuals growing on the tains.

0. *Phleum medium* Brügger: a very productive alpine form adapted eadows and pastures.

Finally we must mention a little-known fodder plant grown by the r in his alpine experiment garden:

1. *Sanguisorba dodecandra* Mor.: from Val Ambria, Southern Switzer- the alpine form has bloom-covered leaves and reddish-violet petioles tems; it is a cold-resistant green crop for the Alps, especially useful l with the alpine form of *Agropyrum caninum*, and has a great future it.

Special mention should be made of some species of plantain grown by riter on the Sandlingalp and subjected to further selection on the Kragl during the last three years; of these the most important is *Plantago tina*, an excellent pasture plant of tufted growth; many varieties arisen during cultivation at lower altitudes. These will be dealt with e writer in a later paper.

III. Behaviour of Alpine Forms (Acclimatisation Races) when Cultivated at Lower Altitudes.

The writer has grown these alpine selection varieties under more favourable vegetative conditions, *viz*, in more sheltered and sunny si in order to obtain more seed than could be hoped for, especially in ripening varieties at an altitude of over 1400 metres.

On the establishment of the Kragl farm (under the writer's d tion) in 1908, selection experiments were begun by means of sowing the of the required alpine forms and pricking out selected plants, of at l two years of age, from the Sandlingalp garden. Kragl was instituted merely as a modern pasture-farm for the furtherance of cattle-breed interests, but primarily to serve in the promotion of botanical research the seed selection of fodder plants.

The selection garden there lies some 820 m. (2700 ft.) above sea le it was formerly a State nursery for forest trees, so that the ground was s able for such experiments without the repeated working necessary in case of the Sandlingalp. The composition of the soil and the manure were the same as in the alpine experiment garden.

The following important facts are shown by the elaborate tables c up by the writer respecting the development through further selecti the forms obtained at Kragl, as compared with the alpine sel varieties.

1. In general, the number of culms per individual is considerably l in the varieties which have been further cultivated than in the parent forms, while the number of leafy shoots (and therefore the tillering v has decreased, with the exception of *Festuca rubra fallax*, *Poa serotina Phleum Michelii*, in which the tillering value is higher.

If the number of the culms and leafy shoots of the parent alpine be taken as 1, the following series represents the proportional numb the varieties which have been further cultivated.

	Culms	Leafy shoots
Festuca pratensis	6.38	0.66
» *arundinacea*	6.25	0.40
Agropyrum caninum	5.67	0.25
Phleum Michelii	4.12	1.63
» *medium*	1.82	0.56
Poa serotina	1.80	1.80
Festuca rubra	1.17	0.86
» » *fallax*	1.07	1.56

2. A remarkable character of all these varieties under further cul is the greatly increased yield of seed, which in *Festuca arundinacea* i twenty-four times as much as in the parent alpine form.

In correlation with this is the increase in the number of spike individual in the new varieties.

3. In like manner the fodder yield increases in the case of the new varithough not to the same extent as the extra seed production; in the ted variety of *Festuca pratensis* it reaches more than ten times as much at of the parent form.

4. If, as in the case of the number of culms and leafy shoots, 1 is taken he yield of the parent alpine form per unit area, we get the following s for the seed and fodder production of the new kinds. These tables ly demonstrate the superiority of the latter, not only over their parent s, but also in comparison with the commercial varieties. A comparietween the two tables further shows that the highest seed yield does oincide with the largest fodder production.

Seed yield of the selected varieties.

	Kragl selected variety	Commercial or original variety
Festuca arundinacea .	23.9	4.4
» *rubra fallax* . .	16.6	5.5
Agropyrum caninum .	11.2	—
Phleum medium . . .	9.3	5.7
Festuca rubra	7.1	3.1
Phleum Michelii . . .	6.7	1.1
Festuca pratensis. . .	3.9	1.4
Poa serotina	2.7	1.8

(Yield of parent alpine form at the Sandlingalp = 1).

Fodder yield of the selected varieties.

	Kragl selected variety
Festuca pratensis . . .	11.8
» *arundinacea*. .	8.3
Agropyrum caninum .	3.6
Poa serotina	2.6
Phleum medium . . .	2.2
» *Michelii* . . .	2.2
Festuca rubra	1.5
» » *fallax* .	1.3

(Yield of parent alpine form at the Sandlingalp = 1).

The new varieties retained their acquired characters for three genera- during further selection and multiplication, and these modifications became intensified. These facts have been determined by the experits of practical breeders.

IV. The Principal Results of this Work.

These may be summed up under three heads:

1. During the further cultivation, in sheltered, sunny spots in the ntains, of alpine forms bred under the influence of the alpine climate

from lowland grasses, new forms again arise ; from these can be bred varieti which are not only far more productive than their parent alpine forms, b are also superior to the best kinds in use or in the trade.

2. The superiority of these varieties is chiefly shown by their seed yie Thus, the further cultivated form of *Festuca arundinacea* in the third gen ration bears 23 times as much seed as its alpine parent. The furth cultivated varieties have, as a rule, also exceeded their alpine parents fodder production.

3. Experience shows that the seed production of all cultivated gras decreases considerably, normally in their fourth year, and this falling also occurs in the case of the new selection varieties ; to obtain a larger a purer seed yield it is therefore necessary to renew the multiplication pl after some years by either transplanting or sowing new selected seed from t lowland selection garden ; the latter must also be restocked with the variet in question taken from the first selection ground, *i. e.* the alpine experim garden. This entails a new and important interrelation between the alpi seed-breeding garden and the further cultivation of the alpine varieties lower places, and also manifests the importance of the alpine seed-gard for the cultivation of fodder in valley farms.

If the data so far obtained do not permit of a decisive opinion be formed, especially as regards the lasting worth of the new selected va eties, they are yet not to be despised, for they open up a new field of wo for both scientific research and practical agriculture.

1143 – **Selection of Pigeon-Pea or Rahar (*Cajanus indicus*).** – Sir, S. Improvement of Rahar by Selection. — *The Agricultural Journal of the Depart of Agriculture, Bihar and Orissa*, Vol. I, No. 1, pp. 25-29 + 4 plates. Pa April 1912.

Rahar is held in high esteem as a food in India. Its seed coats, you shoots and leaves make excellent fodder for cattle ; its branches are u for roofing, basket and thatch work and the dried stalks for fuel. Its vious importance in the rural economy of the natives makes this pl worthy of study and improvement.

Observations were commenced on Sabour Farm in 1908 with a Sa variety. It was noticed that considerable variation existed among plants with respect to the following important characters : growth, mark and colour of the plant, plumpness of pod, colour and size of grains, a character of the flower. The variations were recorded as follows :

A. Habit of growth : 1) erect, 2) spreading.

B. Colour of pods : 1) violet, 2) white, 3) striped.

C. Fullness of pod : 1) inflated, 2) wrinkled.

D. Colour of seed coat : 1) reddish-brown, 2) white, 3) blac 4) spotted.

E. Size of grains : 1) large seeded, 2) small seeded.

F. Flower characteristics : 1) standard yellow, 2) standard yell with red veins.

Among all the multitudinous forms possessing these characters,

r observed a certain degree of correlation. He found the following lated characters :

1. Erect type with large grains and entire-coloured pods.
2. Spreading type with small grains and striped pods.
3. Erectness in form with lateness of maturity.
4. Wrinkledness of pod with roundness of grain.
5. Spotted grains with extreme earliness.

Attempts at selection were also made with respect to earliness, wilt ance and west-wind resistance. Selection work during two seasons ced the following results : 1) Early plants have a low spreading habit he foliage and fruits small. 2) No morphological character appeared correlated with wilt resistance. 3) The thick-podded erect forms generally more resistant to the west wind. 4) Large pods and seeds associated with the erect habit of growth.

In the field trials the erect form was always found to be superior to the ding form ; it is now being grown as a general field crop at Sabour.

- **Comparative Experiments on Red Clover of Different Origins at the valöf Institute during 1907 to 1912.** — WITTE, H. in *Sveriges Utsädesförenings idskrift*. 1913, p. 11.

Most of the red clover seed imported into Sweden is described as "Si- n" a small quantity as "Russian." The former brand includes not seed from Silesia and neighbouring countries, but also that of Hungary, ria, France, Italy, North America and Chile. Only the varieties re- it to a cold winter are of use in this country, and for the pastures of 6 years duration, which is the usual system in Sweden except the ern portion, a very hardy and persistent clover is required. Experience shown that imported clovers vary considerably with respect to their iness and persistence, and this has been verified by the experiments ucted at the Svalöf Institute during 1907-12.

Most of the foreign varieties are early in maturity and characterised erect slightly-branched stems and an early secondary growth, which les two cuttings to be obtained; but they are of so short duration that econd years' crop is very small.

The largest yields have been obtained from seed from Silesia. Posen, nd, Bohemia, the Rhenish Palatinate and Galicia, and often the second 's crop has been as large as the first. Moravian seed is somewhat in- r and that of Austria (with the exception of the Austrian countries al- y named) suffered very badly in the winter. Russian seed was better equal to the Silesian. The Swiss variety "Matten Klee" gave a poor l owing to its earliness and tenderness. The American varieties of the scent type have all given inferior yields, but their hardiness varied rding to the latitude of their origin. The Italian, Brabant, and above he English and Chilian clovers, were lacking in hardiness and dura- y. The late varieties from England and Bohemia matured early but developed somewhat slower than the true Silesian clover.

The late variety, with tall much-branched stems, generally gives only all aftermath, but its total yield for the first year is equal to that of

the early variety; in the second year, in which it gives its biggest cr it considerably exceeds it. Owing to its persistence (it will last five yea this variety is the only one suitable for pastures of long duration.

Most of the Swedish varieties were of this type, as also were those Norway, Finland and North Russia. The foreign varieties, with perh the exception of those of Finland, were generally inferior to those of Swed origin. These native varieties showed considerable differences in t periods of flowering and yields, the latter character being generally rela to their lateness.

1145 – **Manuring Experiments on Alpine Pastures in Carinthia: 1910, 1912.** — SVOBODA, H., of the Laboratory of the Institute for Research and the Ex nation of Foodstuffs of the Duchy of Carinthia at Klagenfurt. — *Zeitschrift für Landwirtschaftliche Versuchswesen in Oesterreich*, Year XVI, Part 7, pp. 745-769. Vie July 1913.

The results of this work and of two previous reports are given gether as follows:

1. The soils of all the alps experimented upon were very poor in P K_2O and CaO. In 100 gms. of air-dried fine earth there were only in 4 c more than 0.1 gm of P_2O_5. The other eight soils contained considerably than 0.1 per cent of P_2O_5, namely 0.003, 0.008, 0.017, 0.019 per cent., The potash content of all the twelve soils was under 0.1 per cent., wi minimum of 0.024 per cent. Only two soils contained more than 1 per c of CaO, one upwards of 0.3 per cent, one over 0.2 per cent., five betwee and 0.2 per cent., three under 0.1 per cent.

2. Tilling the Alpine soil gave everywhere good results; no soil can n rally be more benefited by physical improvement than Alpine soil.

3. In two of the experiments the same fact was observed: that in la down a new ley on an alp after breaking up the old turf, the grass seeds were sown did not sprout unless they were abundantly manured with h yard manure or chemicals. After broadcasting, the grasses did not dev sufficiently to form the new turf till three and four years, accordin the altitude. The vegetation obtained at last was poor and was comp chiefly of weeds, *Aira* and *Nardus stricta*.

4. With one single manuring of farmyard manure (St) or chem alone (K), or of a mixture of both (K + St) the average crop of hay wa following during the first five years, in cwt. per acre.

Manures	1908	1909	1910	1911	1
Unmanured	7.71	8.76	14.01	19.59	1
St	17.44	20.72	19.20	20.89	1
K	18.56	14.30	19.75	27.92	1
K + St	23.34	23.97	21.33	28.11	1

The crops from the unmanured plots are light on account of the impov-ed state of the soil. Reckoning them at 100 the increases due to the ures are given below.

Year	Stable manure	Chemical manures	Stable and chemical manure
. . . . .	2 to 2 1/3 times as much	2 1/4 to 2 1/2 times as much	fully 3 times as much
. . . . .	"	100 : 150 to 160	2 3/4 times as much
. . . . .	100 : 137	100 : 142	100 : 152
. . . . .	100 : 106	100 : 142	100 : 143
. . . . .	100 : 116	100 : 142	100 : 138

In some cases the writer observed extraordinary increases of the crop, uch as 4 to 7 times the amount from the unmanured plots. The results e various years confirm each other satisfactorily.

The effect of the stable manure during the first and third years was equal at of the chemicals, and in the second year even better, but in the fourth fifth years it was considerably inferior and barely noticeable. The com-tion of stable and chemical manures had the best results and during the three years was superior to that of the other manures applied separ-; in the two last years however it was of equal value to the artificials. considerably longer duration of the after effects of artificials as com-d with farmyard manure is proved beyond all doubt. The after ts of stable manure lasted about three years, those of artificials about Only after this period did the increase of crop due to artificials : to be noticed on some of the alps.

For the practical Alpine farmer—as in general for all farmers—the bination of farmyard and chemical manures is advisable.

5. Respecting the water content of green forage and the ratio between and the dry substance in hay the writer noticed variations ranging from to 60.4 per cent. of hay in the green forage, while the hay contained 1 80.3 to 90.1 per cent. of dry matter. The plots that gave the lowest l, thus the unmanured and the St. plots, gave the driest green forage, heavier bearing plots (K and K + St) the richest in water, there g a sort of compensation in the higher hay and dry substance content ie smaller crop. On the other hand the quality of the dry straw-like s of the poorer plots is naturally inferior to that of the juicy forage ie good Alpine meadows, which is always richer in protein. In general ay be said, with the increasing yield of a plot the water content of the crop increases and this may be explained by the fact that the drying n of the sun is not so powerful on a dense vegetation as on a thin and ty one.

Level Alpine meadows bear much more abundantly than those situa on slopes, which is to a certain extent due to the lesser leaching out of pl food from the humus and washing away of the fine earth and to the circu stance that the slopes in some aspects, are exposed to a more intense actio the sun.

The writer mentions another observation made elsewhere: the analy of three samples of grass which was cut on August 22, 1912, near Malli at different altitudes above sea level:

Height above sea level . . .	7 710 ft.	6 725 ft.	5 905 ft.
	per cent	per cent	per cent
Crude protein	17.90	15.90	12.90
Crude fat	2.62	2.64	1.84
Ash	8.34	6.62	9.58

From the above it would appear that the protein content increases w increase of altitude; this question is sufficiently interesting to deserv be more closely studied and on more ample material.

6. The sowing of good forage grasses and clovers on Alpine meadow a measure strongly to be recommended. In the above-mentioned experim timothy and dog's-tail proved to be the best grasses; they are of slow good growth both on limestone and on primary rocks. Fox-tail, yellow and alsike clover grew luxuriantly the first year after sowing, but then t growth slackened and they even disappeared completely. In order to prev this disappearance it is necessary, after the first initial manuring, to rep every year the application of animal and mineral fertilizers, for already four or five years, areas which presented a quite different botanical pop tion, lose the best sorts of grasses, get invaded by weeds and end by be covered with the same plants, generally of a poor description.

7. The use on the alps of the best possible artificials, notwithstand the high cost of transport, which by suitable measures may be m reduced, is in the end the most profitable course to pursue, owing to great increase of crops which they cause and to the length of time o which their after effects extend.

1146 – ***Desmodium hirtum*, Leguminous Forage Plant Recommended the Prevention of the Development of Weeds and as Green Manur Tropical Plants.** — STOLZ, A. and HARMS, H. in *Der Tropenpflanzer*, Year 17, N pp. 430-437. Berlin, August 1913.

This plant is an addition to the number of nitrogen-bringing green nure plants, which grow rapidly forming a dense cover, capable of prevent the development of weeds and of protecting the soil against leaching by torrential rains and the heat of the tropical sun.

The habitat of *Desmodium hirtum* (Guill. et Perr.) is fairly extensive is found in Natal, German East Africa, Senegambia, Sierra Leone, Togo Kamerun. It grows from sea level up to an elevation of about 5 600 f It is a herbaceous climbing plant, the branches attaining a length of

ft. In German East Africa the plant loses its leaves in July and August and many of the branches die, but in September vegetation starts , new branches cover those that have died and which go to form an llent humus.

The production of the seeds is not very easy, consequently the writers mmend the following method. The seeds are sown in a rich, loose, fresh the seedlings are transplanted when about 4 inches high into loose soil. ; vigorous plants are obtained which produce numerous cuttings. The ers insist on the necessity of taking only rooted cuttings, and they se choosing a rainy season for making a plantation and setting the ts 3ft. apart.

This *Desmodium* is very sensible to the physical state of the soil; it a decided preference for tilled soils and develops much more in plan- ms than in the wild state.

In a rich soil this leguminous plant forms a cover one foot deep h completely prevents the growth of weeds and thus allows a great omy of hoeing; besides this, *Desmodium* may be utilized as green ure and as food for live stock, sheep and asses being especially l of it.

- **Cotton Problems in Louisiana.** — Cook, O. F. in *U. S. Department of Agriculture, Bureau of Plant Industry, Circular* No. 130, pp. 3-14. Washington, June 21, 1913.

The production of cotton in Louisiana is at present traversing a crisis hich the chief causes are the following:

1. — The higher cost of farm labour and the difficulty of finding suffi- hands for picking due to the double exodus to the cities and towns to Texas.

2. — The boll weevil finds here specially favourable conditions: the pre- of late maturing varieties of cotton, the great luxuriance of vegeta- development, the great extent of wooded country, affording unusual ties for the hibernation of the insect.

3. — The tendency of the cotton industry to replace the long stapled ns by short staples is injurious to the lower Mississippi Valley (Loui- a and Mississippi) which produces the best Upland long-staple of all the n belt.

4. — The introduction of large public gins instead of the old separate tation gins had led:

a) to a mixture of seeds rendering it difficult to secure supplies of l seed;

b) to a mixture of various cottons injurious to the quality of the fibre causing complaints on the part of the buyers.

The writer studies the means of improving this state of things.

1. — Control of the boll weevil: *a*) promoting scientific research with object of obtaining long-staple *early* varieties and testing the methods of ivation calculated to increase this quality (root-pruning, closer planting, ing, etc); *b*) organizing communites of planters for the *collective* con-

trol of the insect, which is the only efficient means of obtaining practi results.

2. — *Improvement of the quality* of the produce by means of these gro of planters, who should rigorously select their seed and strive for a uni product.

3. — *Education of the consumer*. The improvements of spinning mac ery have made it possible to spin short cotton and produce fabrics cl similar to those previously made from long staples. But the short-st fabrics are undoubtedly inferior in strength and durability to the long-st ones. As this change is against the interests of the consumer as well a the planter of long-staple cottons, and profitable only to the spinner, public should be illuminated on the subject.

4. Lastly the writer proposes the acclimatization into Louisiana of c tropical crops, so that cotton may become a branch of a saner and diversified system of agriculture, which would be especially advanta for the better utilization of labour.

1148 – **Cotton in India.** — SCHANTZ, MAURICE in *Beihefte zum Tropenpflanzer*, Vol. No. 5-6, pp. 439-609, Berlin, August 1913.

This article supplements the monographs already published on C Cultivation in the United States and Egypt.

Historical. — The author outlines the history of cotton cultiv from 800 B. C. Table I shows the effect of the War of Secession in 1861 on the production of Indian cotton.

TABLE I.

Year	Exports	
	Quantity	Value
	tons	millions sterling
1860	170 300	7.3
1861	176 400	10.0
1862	211 100	18.5
1863	245 600	35.1
1864	234 400	36.8
1865	358 350	34.9
1866	189 950	16.2
1867	274 150	19.7
1871	361 250	20.9
1878	148 300	7.7

Many attempts have been made to improve the quality of this fibre the results are now being felt. In particular the author mentions the of the Cotton Supply Association, the British Cotton Growing Asso-n, the International Federation of Master Cotton Spinners' and Manu-rers' Associations, and the Indian Government.

Soils. — In India the three great cotton areas correspond to three great gical formations. 1) The northern zone comprising the alluvial soils e Bundelkand and the valleys of the Indus and Ganges, which vary the sands of Sind and the Punjab to the clays of the United Provinces. The midde zone extending from Rajputana to the Dekkan con-of the famous " Regar " or Black Cotton Soil, the richest soil in India. he Southern zone consists of a soil of crystalline origin and comprising ferruginous, red and yellow lands. The " Regar " soil is also found in zone, particularly in the districts of Tinnevelly and Coimbatore.

Climate. — Owing to the monsoons, India receives 90 per cent. of its fall during the summer or south-west monsoon. The distribution of rainfall is very irregular, causing thereby the proverbial famines of dry s; the mean annual rainfall varies from 23 cm. to 358 cm. in the various inces. When there is not enough rain the cotton has to be irrigated. Government has been much concerned with this question and has re-ed the old canals and constructed new ones, so that in March 1912 the l length of these canals reached 58 000 miles.

Geographical Distribution. — Cotton is cultivated to some extent ughout India. In Berar one-third of the cultivated lands is given up to crop, in Bombay 10 per cent., in Madras 5 ½ per cent., Central Provinces per cent., North-West Provinces 4 per cent. Sind 3 ½ per cent., and he Punjab 2 ½ per cent. This shows the relative importance of this in each province, while the following figures show the distribution of cotton areas in the different provinces.

Provinces	per cent.
Bombay	28
Central Provinces and Berar	22.5
Haiderabad	13.9
Madras	8.4
Punjab	8
United Provinces	6.2
Central Provinces	4.4
Baroda	3.1
Rajputana	2.1
Other provinces	3.4
	100

Species cultivated in India. — The writer has divided the different genous varieties into three groups: *Gossypium arboreum, G. nanking,*

and *G. obtusifolium*. The exotic varieties which have been introduced more or less success are divided into two groups according to the appear of the seed, thus: *a*) with covered seeds - *Gossypium hirsutum* (Upl *b*) with naked seeds - *G. purpurescens*, *G. vitifolium* and *G. brasili*

Commercial varieties. — Table III gives a résumé of the characte Indian cottons.

TABLE III.

Name	Colour and appearance	Length mm.	Diame mm
Oomras	white-cream, silky	—	—
Khandesh	dirty	10–16	1/50 -
Berar type	clean	10–25	1/60 -
Berar special good staple	clean	20–30	1/50 -
Dholleras	white, silky	15–25	1/60 -
Broach	white, silky, clean	16–26	1/60 -
Broach Surtee	veny beatiful white, silky	20–30	1/60 -
Bengal	white mixed with yellow flocks	13–16	1/60 -
Sind	clean, yellowish white	13–16	1/60 -
Punjab	white, half silky	17–22	1/60 -
Assam	white, very clean and short	10–13	1/80 -
Burma	white to khaki	13–16	1/60 -
Kumptas	yellowish brown, silky	19–22	1/80 -
Dharwar American	beatiful white, silky	16–20	1/60 -
Westerns	white to yellow, very dirty	20–24	1/60 -
Northerns	deep yellow to red	20–24	1/60 -
Cocanadas	reddish brown to white	20–24	1/60 -
Tinnevelly	white to cream, strong, silky	23	1/80 -

From the point of view of quantity, Oomras are the most impor representing almost half the production of India. The best quality c is the Broach, followed by Dharwars; Sindhs and Punjabis resembl Bengal varieties which constitute the lower grades; whilst the Oomra of average quality.

Area under cotton and yield. — The areas and yields of the various Pro- s are given in Table IV.

TABLE IV.

Province	Area under cotton in thousands of acres	Yield in thousands of bales (400 lbs.)
ay	5 932	1 302
al Provinces and Berar	4 523	910
as	2 426	317
ab	1 575	346
ed Provinces	1 148	425
h	288	121
na	227	45
jal	89	19
and Eastern Bengal	86	31
Provinces	55	13
and Marwar	51	20
abad	2 888	300
al Provinces	1 314	206
a	762	196
tana	393	127
e	154	19

Whilst the yield per acre for the United States is 175 to 215 lbs. and of Egpyt 340, it is only 100 for India.

The yield varies considerably from the South to the North, where it eatest. Table IV shows this variation and the effect of irrigation.

Yield of lint. — The quantity of lint amounts to about one-third of the ght of the crop : this proportion varies from about 25 per cent. for Rozzi bout 41 per cent for Comilla.

TABLE V. — *Yield of cotton in lbs. per acre.*

Province	With irrigation	Without irrigat
Sindh	308	—
Ajmir and Marwar	—	192
Berar	—	144
United Provinces	190	130
Bombay	—	100
Punjab	109	80
Upper Burma	—	80
North-West Provinces	183	72
Bengal	—	75
Central Provinces	—	75
Mysore	—	52
Madras	—	45

Seeds. — The ratio by weight of the seeds to the fibre is about 7 Apart from their use for sowing they are largely used for feeding c on the spot (4 to 5 lbs. a day). The exports from Bombay for feedin increasing each year.

Year	Exports of Cotton Seed
1897–98	28 360 cwt.
1900–01	225 000 »
1910	6 000 000 »

Cultivation — The cotton plantations are not in the hands of Euro planters, the crop being grown by the inhabitants. Sindh and Madra the only Provinces in which the perennial species are still grown. seeds, often mixed with other grains, are generally sown broadcast in Central and United Provinces, Berar and the Punjab.

A rotation is practised consisting of wheat, millet, oleaginous and l minous plants. About 10 lbs. of seed is sown per acre. Sowing is u usual in June, but there is probably not a month in the year in which so does not take place in some part of India. The growing period is simil variable. The Oomra variety matures in 4 or 5 months, whilst Su Broach requires 8 months. The first picking generally gives the best qu and the second the greatest quantity, whilst the third is inferior in quality and quantity.

There is not the same uniformity in production of cotton in India there is in Egypt and the United States, so that the writer studies different districts in detail.

Principal Cotton Centres.

1. *Punjab.* — The soil is generally alluvial or sandy, and owing to the rainfall of 600 mm. (150 to 180 mm in the West) the cotton crop requires irrigation. The canals are well developed and irrigate about seven million acres. The Chenab canal, the greatest in India, has transformed was 70 years ago an arid desert near Lyallpur, into a fertile region. of this land is held by small owners (with 4 to 6 acres) who apply principles of modern agriculture, and the yield is considerably greater his district than in most of the regions of India.

2. *Bombay Presidency.* — *a) Sindh.* — This district resembles Egypt ing a desert traversed by a river and a fertile valley. The mean rainseing only 180 mm., irrigation is indispensable ; cotton is limited to listricts of Haiderabad, Thar and Parkar, where irrigation is possible. The inhabitants cultivate only a third or even a fifth of their land, the rnment allowing the land to be fallow for 5 years.

On the hill lands the Sailabi method is practised: first irrigation, then ng followed by frequent irrigations, because the soil does not retain the r. The Bosi method is applied to the inundated area which is not irrid after the sowing.

Since 1852, numerous experiments have been made to introduce eties having a longer staple, but disease and atmospheric conditions e been unfavourable to their success. The experiments have shown that n the irrigation canals are finished, it will be possible to cultivate varis of cotton such as Mitafifi, which, with careful harvesting and prepara, will equal the "fully good fair brown „ Egyptian. This would yield nfit of 60 rupees (80*s*) per acre in place of the 42 (57*s*) which is obtained he Sindh under the same conditions. It is also hoped that similar succ will be obtained with the Upland, which required only 12 to 13 irrigain place of 22 required by Mitafifi.

b) Gujerat North or *Kaira-Ahmedabad.* — A sandy soil with a rainfall o to 950 mm. produces a yield of raw cotton (variety Dholera) of 200 er acre without irrigation, and up to 1200 lbs. with irrigation. Most is crop goes to the spinning mills of Ahmedabad.

c) Gujerat South — The famous variety Surtee Broach originated . It is the best native variety, but Surat Deschi Broach is the most vated. The soil is a black clay, only tillable after the rains, which amount 50 or 1150 mm. per annum. Irrigation is not practised ; the people are ligent and the system of cultivation is the best in India.

d) Deccan of Bombay. — This supplies most of the Bombay requirets. It has a clay soil and a mean rainfall of 700 mm. Cotton is the product of the North and the variety Oomras is mostly grown.

e) Mahratta South or *Karmatak.* — This region comprises the southern tion of the Bombay Presidency. About 600 000 acres are given up to on and two varieties are cultivated: 1) Kumptas, giving 300 to 400 of raw cotton with a yield of 25 to 29 per cent. of lint, is a variety of ach and there s a tendency to substitute for it the true Broach which ds 100 lbs. p. acre, containing 34 per cent. of lint, with a market value

12 per cent. higher; 2) American Dharwar; this variety has degenerat and is being replaced by Cambodian.

3. *United Provinces.* — The western portion (Agra), which is well wate all the year, is the most important for cotton. About one-third is irriga and the remainder receives an annual rainfall of only 820 mm. Some the land is held by small owners in plots of 5 to 10 acres. The variety c tivated is Bengalee. Attempts to introduce varieties of long staple ha been unsuccessful.

4. *Central Provinces and Berar.* — This is the centre of the cotton c tivation of India, and cotton here ranks second in importance in the text trade. Three principal varieties are cultivated: *a*) Bani, one of the m beautiful cottons of India with a length of staple from 25 to 28 mm., a can be spun up to No. 40; it is being abandoned, an account of low yield of lint (26 to 27 per cent) in favour of the more productive] *b*) Berar Jari; this variety yields 35 per cent of lint, is very popular in market on account of its wooly appearance, and is used in the manufact of "Vicuna" cloth. It is a mixture of about 65 different varieties, amo which are *G. malvensis, G. vera, G. rosea, G. rosea cutchia* and Bani. *c*) Bo a Georgia-Upland variety obtained at Calcutta and the most hope of all the exotic varieties tried.

The most important cotton region is the valley of Payanghat, wh the best product is obtained and 40 per cent. of the arable land is reser for this crop. The rainfall varies from 750 to 1250 mm., and it is ge rally not necessary to irrigate. The methods of cultivation are quite pri tive; cracking of the clay soil during the dry season takes the place of tivation. Sowing takes place in June and the crop is harvested in O ber, as from November onwards the drought induces tearing of the m

5. *Madras Presidency.* — The annual rainfall is 700 to 760 mm. for Ti velly, 630 mm. for Coimbatore and 480 to 540 for Bellary; this is not alw adequate and requires to be augmented by irrigation. The varieties c vated are: *a*) Uppams, sown in May and July on the black cotton soil; consist of about 8 different varieties, and are grown chiefly in the N of Tinnevelly and the south of Madoura. *b*) Nadam or Ladam, a perer variety sown in September and November in red sandy soils; prod the cotton known as "cocanadas". *c*) Tellapatti (Uppam × Bour yields Westerns (Bellary and Karnul) and Northerns (Tadpatri Salems, a mixture of Uppams, Ladams, and Bourbon, met with in Coimbatore. *e*) Cambodian has made rapid progress:

Years	1908	1909	1910	1911	1912
bales of 500 lbs.	40	1 650	7 500	30 000	80 000

On land manured and irrigated it gives 1250 to 1600 lbs. of raw cot per acre, with a yield of 33 to 35 per cent. of lint; whilst the native varie give 60 to 100 lbs. of lint, Cambodian reaches 500 and more, and the duce fetches 1*d* a lb. more.

xports. — Cotton is an importamt factor in Indian commerce. In 12 its export reached the value of 406 million rupees (27 millions sterl- nade up as follows.

	Value in thousands of rupees.
Raw Cotton	293 341
Seed	15 191
Thread	75 901
Goods in bales	19 666
Shawls and handkerchiefs	1 525
Various	695
	406 319

The article concludes with a study of the cotton trade and industry e Indian Empire.

- **The Kapok Industry.** — SALEEBY, MURAD M. *The Government of the Philippine lands, Department of Public Instruction, Bureau of Agriculture, Bulletin* No. 21, pp. + plates VIII. Manila, 1913.

The Bulletin is written to supply the steadily increasing demand for ble information concerning the culture of kapok. It is based on experi- s in Java and the Philippines.

The kapok tree is extensively cultivated in the East Indies, Tropical a, Ceylon, Java and the Philippines. There are some eight species *eiba* known in Tropical America, but their product is inferior to that he true kapok, *Ceiba pentandra* Gaertn. (= *Eriodendron anfractuosum*). It is sometimes confused with the species of the allied genus *Bom-* of which there are 40 or 50 species all yielding floss of an inferior e. They can be distinguished by their much greater size (the true seldom exceeds 40 feet) and their much larger red flowers, 3 to 4 length.

Seed selection. — The majority of the trees in the Philippines are pro- ed by cuttings. Some are raised from seed without the slightest regard e selection of good seed of desirable parentage, and this accounts for ck of uniformity in size, number and development of pods. Seed should lected from trees more than 5 years old, of rapid growth, early and m fruiting habits and which are heavy yielders.

The following table shows the wide variation in the characters of the

Climate. — Successful cultivation can only be accomplished in the tro- and the best results are obtained at an altitude below 1,500 feet. It withstand comparatively long periods of drought and from the first arance of the flowers until the pods have been harvested a period of ght is essential. Continuous showers of rain during this period, especially latter part of it, often seriously interfere with the development of the and damage the floss. Strong winds, particularly typhoons, cause us damage to the long heavy horizontal branches and often uproot the

Length of pod	Total weight of pod	Weight of floss	Number of see
mm.	gms.	gms.	
152	39.5	7.0	10
137	33.5	5.9	18
129	30.0	5.0	14
113	27.0	4.9	10
106	24.7	4.7	18
101	17.5	3.0	7

Cultivation. — This tree flourishes in a wide range of soils, but the results are obtained from a well-weathered volcanic soil. Inferior are generally considered unsuitable for planting on a large scale, and o to the somewhat low returns from kapok it does not justify itself on a soil unless grown as a subsidiary crop.

Cuttings should not be of the same season's growth ; they should one half to 2 metres (18 in. to 6 ft. 6 in.) in length. They are planted 50 cm. (20 in.) deep at the beginning of the wet season. Trees grown cuttings generally yield a crop 6 to 12 months earlier than those from but seed propagation has distinct advantages in healthier trees, more ductive and resistant to wind and pests. Seeds are sown at the begi of the wet season in hills 15 cm. (6 in.) apart. Until the seedlings hav tained a height of 12 to 15 cm. (5 to 6 in.) they require shade prote They are ready for transplantation at the age of 10 to 12 months. F transplanting, all the leaves should be removed and the stem cut ba a height of 50 cm. (20 in.). The trees should be planted in straight 6 or 6 ½ metres (20 or 22 ft.) each way. No cultivation is required established, unless some intermediate crop is grown. As secondary the following are recommended : Maguey, sisal, henequen, Mauritius h

Harvesting. — The first crop is obtained between the third fourth year ; normal crops are borne in the sixth and seventh years, wi increasing yield up to the thirtieth year. Harvest must be complet June before the wet season. The pods are harvested when light brown wrinkled. Unripe pods yield floss lacking in lustre and liable to ferm tion, while over-ripe ones yield a dull floss lacking in elasticity. The must be sorted, graded, and cleaned. Hand cleaning is very tedious is now superseded by specially constructed machinery.

Marketing. — It is generally sold under two classes, cleaned an cleaned. Each class is further subdivided into grades thus:

A. Cleaned : 1) extra ; 2) good (prime Java), or first qu 3) second quality ; 4) damaged.

B. Uncleaned: 1) good, or first quality; 2) ordinary or fair quality; aged.

he bales are made of about 10 cubic feet capacity and weighing n 80 and 100 lbs. To effect this, a pressure of 80 000 lbs. is required.

roduction. — Java and the Philippines are the chief countries export- pok, and the amount exported is but a small fraction of the quantity ced.

Years	Total exported in tons	
	from Java	from the Philippines
. . . . .	4 400	—
. . . . .	4 675	—
. . . . .	6 300	4
. . . . .	5 875	13 ½
. . . . .	8 250	37
. . . . .	6 900	27
. . . . .	8 000	10
. . . . .	7 930	30
. . . . .	9 906	98
. . . . .	10 235	31 ½

he exports from British India and Ceylon amounted to 200 tons in nd this amount has not increased since ; the product is decidely in- to that from Java.

ield. — From average trees of normal growth under seven years the yield is estimated at 350 to 400 pods. Trees from seven to ten should yield 600 pods or more.In some cases 150 pods yield 1 kilo s.) of floss, but the average is more nearly 230 pods per kilo. Thus are of land containing 280 trees should yield about 100 000 pods, pro- 450 kilos of clean kapok per year. In the tenth year this would reased to 640 kilos. The yield of seed is double that of the floss.

By-products. — The seed is roasted for food by the natives of India es of famine. The Chinese and Javanese extract an oil from the seed, l is used for soap making and adulterating other oils, whilst the resi- s used as a manure or as cattle feed. Analysis shows that the seed ins about 2 per cent. of oil.

The trunk is used for telegraph poles and as a support for pepper plants. ood, which is light and soft, is used for tanning leather and other minor

purposes. It also yields a dark red opaque gum which has medicinal v
The bark contains a reddish fibre sometimes used for tying purposes.

Enemies and Diseases. — It has few serious enemies. *Dysdercus gulatus* Fabr. attacks the pods, and a species of *Helopeltis* attacks the leav
The worst enemies are bats and monkeys. No fungus or bacterial dise
has yet been reported as attacking the kapok tree.

1150 – **The Cultivation of Sisal Hemp in German East Africa** (1). – Ba
WERNER FRIEDERICH in *Arbeiten der Deutschen Landwirtschafts Gesellschaft*, No.
70 pp. Berlin, 1913.

Historical. — In the agricultural annals of the German colonies th
is perhaps no example of so rapid a development as that of sisal. In 1
Hindorf, on behalf of the German East Africa Company, bought in Flor
1000 sisal plants which were sent to the Kikogwe plantation near the mouth
the Pangani ; of this number only 62 took, and this is the origin of s
cultivation in German East Africa which in 1912 occupied 52750 acres.

Extent. — In this colony sisal is cultivated: 1. In the North along
Tanga-Moschi and Korogne railways at the mouth of the Pagani. 2. Fr
Dar-es-salam to Kilossa. 3. In the South in the Lindi Mikindani reg
near the mouth of the Rowuma.

After ceara, sisal is the most important industrial crop of this reg

	Area		Value of Exp
	Planted	Bearing	
	acres	acres	£
Ceara	80 724	28 469	233 13
Sisal	52 697	28 067	221 002

Progression of the Exports of Sisal.

1901	15 tons
1905	1 400 »
1910	7 000 »
1911	10 000 »
1912	16 000 »

Varieties. — An unsuccessful attempt was made to introduce wi
sisal from Yucatan : *Agave Fourcroydes* (Lemaire) or *A. elongata* or *A. rig*
var. *elongata*. At present the only variety grown comes from Florida (cf. h
torical); it is the same as " Henequen verde " of the Spaniards or " gri
Sisal " of the Germans; its botanical names are *Agave Sisalana* Perrin
A. rigida var. *Sisalana*.

(1) For conditions of soil, cultivation etc. see also a report of a journe
instruction by Hr. Bruck in No. 250, *B*, March 1913.

mate. — In German East Africa, sisal can be cultivated up to 1480 ove sea level, but the best results are obtained below 660 ft. The of rainfall may vary from 39 to 48 inches, and it may even sink ches if the moist and dry seasons are sharply separated.

sition of Grman East Africa in the world's market of Agave fibre.

Henequen (Yucatan sisal)	136 766 tons
Sisal (Green sisal) :	
German East Africa	15 700 »
Java	3 900 »
Bahamas	3 100 »
Hawai	492 »
Papuasia	295 »

Elaeis Fruits without Stones. — GATIN, C. L. in *Journal d'Agriculture tropicale*, ar 13, No. 145, pp. 205-208. Paris, July 1913.

ll seedless fruits are called *parthenocarpic* and the phenomenon which in the production of fruits without seeds is known as *parthenocarpy*. *arthenocarpy* is said to be *vegetative* when the pollen does not come ontact with the pistil; and *stimulative* when the pollen coming ontact with the stigma does not cause fecundation but only a slight lus.

Varieties of Elaeis nigrescens.

Varieties	*communis* (A. Chev.)		*pisifera* (A. Chev.)	*Coradia* (A. Chev.)
	typical form	form with thin shell		
1) oily pulp, proportion by weight . . .	48 %	68 %	84 %	85 %
2) stones . . .	large thick shell	tendency to grow smaller	small, shell very thin, sometimes absent	small, thin shell
al 1) proportion by number . . .	1/10	1/10	rare	2/3
2) characters. .	small, pulp: not very oily: very hard stone	oily pulp: tender stones		almost as large as the normal fruit, pulp oily

The parthenocarpic fruits of *Elaeis* seem to belong to this latter cas closer knowledge of their production would be of great interest from the p of view of the study of the biological conditions attending upon the pro tion of varieties.

The subspecies *Elaeis virescens* will not be considered, not being interest from a cultural point of view.

The table on the preceding page shows the difference between the veral varieties of *Elaeis nigrescens*.

This table shows two points upon which selection should bear.

1) *Normal fruits*. The *pisifera* variety is particularly interesting for reduction of its stones.

2) *Abnormal fruits*. A special position must be accorded to the Cen variety, which shows a considerable proportion of fruits without stones

1152 – **Contribution to the Study of the Castor-oil Plant.** — RIGOTARD, L. in *L'* *nomie Coloniale*, Year 1, No. 1, pp. 15 to 21. Paris, July 1913.

The writer gives some data as to the yield in oil of castor-oil seeds French West Africa.

Guinea: Brown mottled seeds; oil from the whole seed 42.50 to 4 per cent.

Ivory Coast: Brown mottled seeds; stems brown or red. Oil: 43.36 to 4 per cent.

Upper Senegal, Niger.—Several varieties (blood-coloured castor, g Brazil, Zanzibar, etc.) : 41.7 to 54.6 per cent. This latter figure, which responds to 64.77 per cent. of oil in the kernel, has been obtained from s that came from Brazil and were cultivated in French West Africa. term of comparison it is stated that Indian castor gave an average of a 47 per cent.

1153 – **Plantation Rubber in Hawaii.** — ANDERSON, W. A. in *Hawaii Agric* *Experiment Station, Press Bulletin*, No. 44, pp. 1-12. Honolulu, July 1, 1913.

This Bulletin contains the last results obtained in the Naliku tation.

1. *Distance*. — It is more advantageous to plant closely and subsequ thin out until those that remain are 20 by 20 feet apart, than to plant trees at once at this distance. The chief advantage of the system is it allows selection by means of thinning. The disadvantage of less unifor of the stand due to selection will be amply compensated by the increas yield during the first years (owing to the greater number of trees).

2. *Multiplication*. — In order to make a new plantation the way is to use selected cuttings taken from the best yielding trees.

3. *Cultivation*. — The control of weeds by means of hoeing is too costly causes loss by erosion; the most practical method was found in the arse of soda spray, provided it be not allowed to touch the stems of Ceara t under two years of age or of Hevea trees at all. The aeration of the by means of dynamite costs only 15 to 20 dollars an acre, and does not c much erosion.

4. *Tapping.* — Up to now the best way of tapping Ceara consists in re-ing the outer bark in narrow vertical strips and tapping these strips ncision, allowing the latex to coagulate on the ground. It is hoped that od type of container will soon be found.

5. *Curing* — This operation has a very great influence on the quality he product. Drying in the air at ordinary temperature has not given a formly good product; it should be completed by the vacuum dryer at cial temperatures not greater than 120° F.

6. *Value.* — When it is properly prepared, Hawaii Ceara commands s not much inferior to those of Ceylon plantation, namely about 10 per cent. less.

- **Experiments in Manuring on a Tea Estate in Darjeeling.** — BALD, C. n *The Agricultural Journal of India*, Vol. VIII, Part. II, pp. 157-160. Calcutta, April 1913.

The plan of the experiments was as follows:

of plot h meaning half acre)	Manure applied		
	1909	1910	1911
	Castor meal, 14 maunds per acre	Castor meal, 4 maunds per acre. Nitrate of potash, 40 lbs. per acre. Superphosphate, 120 lbs. per acre.	id. id. Superphosphate, 60 lbs. per acre. Sulphate of ammonia, 120 lbs. per acre.
2	Mature leaves of *Cajanus indicus*.	id.	id.
3	Castor meal, 7½ maunds per acre	Nitrate of potash, 40 lbs. per acre. Superphosphate, 120 lbs. per acre.	Animal meal, 2 maunds per acre.
	Nothing (check plot).	Nothing (check plot).	Nothing (check plot).

The block of land which was selected for these experiments was as y equal in quality as it was possible to obtain, but the event proved the quality of the check plot soil was the best.

A digest of the results for the three years in crop is as follo

Tea per acre in	1909	1910	1911	Tota
	lbs.	lbs.	lbs.	lbs
Plot No. 1	247	265	345	857
» No. 2	239	313	324	876
» No. 3	258	270	312	840
» No. 4	275	305	286	867

With a view to determining whether there was any difference in quality of the teas produced under the different circumstances, sam of tea from all four plots were prepared and were valued on Sept ber 18, 1911. The valuations per lb. were 10½*d*, 11*d*, 9*d* and 1s respecti

The cost of treatment works out as follows:

	1909	1910	1911	Tota
	£ s d	£ s d	£ s d	£ s
Plot No. 1	4 5 4	2 4 6	2 19 6	9 9
» No. 2	— 6 1	— 6 1	— 6 1	— 18
» No. 3	2 2 8	1 1 10	1 1 2	4 5
» No. 4 check plot; no expenditure.				

The total crop from No. 4 is comparatively high. Apart from the tion of the relative quality of the teas produced, the extra crop from is not sufficient to pay for the treatment given it, while the cost of t ment to No. 1 is altogether prohibitive.

The valuation of the samples places No. 4, the untreated plot, h higher than any of the others, while the green-manured plot comes se and the plot treated with animal manure is given a very low place. valuations, however, cannot be regarded as final.

Some of the outstanding facts in connection with these experim are the high cost of chemical and artificial manures in a remote di like Darjeeling, the extreme doubtfulness of their economic utility, above all the fact that green manuring is the cheapest method and a same time produces remarkably satisfactory results.

. **Cultural Experiments with Medicinal Plants at Korneuburg in 1912.** — TLACHER, WILHELM. (Mitteilungen des Komitees zur staatlichen Förderung der Kultur n Arzneipflanzen in Oesterreich, No. 15) in *Zeitschrift für das Landwirtschaftliche rsuchswesen in Oesterreich*, Year XVI, Part 8, pp. 833-848. Vienna, August 1913.
i comprehensive report of the cultivation of medicinal plants in Austria
2. Detailed information respecting the sowing, development, manage- (in many cases manurial experiments), harvestings, yield, etc., of the ring plants: hollyhock (*Althea rosea*), *Ancyclus officinarum*, *Angelica ngelica*, *Anthemis nobilis*, marigold (*Calendula officinalis*), *Cnicus be- us*, hemlock (*Conium maculatum*), thorn-apple(*Datura Stramonium*), oppy (*Papaver Rhoeas*), *Datura Tatula*, foxglove (*Digitalis purpurea*), na *lutea*, *Grindelia robusta*, *Hyosciamus agrestis*, henbane (*Hyosciamus* , *Hydrastis canadensis*, hyssop (*Hyssopus officinalis*), *Mentha crispa*, der (*Lavendula spica*), *Levisticum officinale*, *Mentha canadensis* var. *scens*, peppermint (*Mentha piperita*), rue (*Ruta graveolens*), sage (*Sal- ficinalis*), *Spilanthes oleracea*, valerian (*Valeriana officinalis*), *Verbascum oides*.

. **Cultivation of Lavender in the South-East of France.**— ROLLAND, M. in *Vie Agricole et rurale*, Year 2, No. 37, pp. 285-289. Paris, August 16, 1913.
Economic position of essence of lavender. — For the last twelve years rice of essence of lavender has more than doubled, and has kept dur- everal seasons at about 10*s* 9*d* per pound. This rise seems to be to the discovery of a process which allows the economic extrac- rom this essence of some compounds used in the manufacture of per- y. On the other hand the yield of lavender plantations diminishes ly and the work of reafforestation carried out by the Forest Admini- on reduces considerably the areas on which wild lavender grew.
Species of lavender. — They are numerous in France. But as the most ned French lavenders are those gathered on the subalpine chains e South-East, especially in the Departments of Drôme, Hautes-Alpes, s-Apes, Vaucluse and Alpes-Maritimes, the writer only mentions the of lavenders which are found in that region and which are interesting a cultural point of view. The essence of lavender proper is supplied o forms of *Lavandula vera* DC.: *Lavandula vera fragrans*, Jord. and *dula vera delphinensis*. These are the only two small species which ve to be multiplied and they are found most frequently associated in natural habitat. These two real lavenders are not found in the South- at a height inferior to 1300 feet. Below this height they have yielded place to common lavender: *Lavandula spica* Chaix or *latifolia* Vill. lavender gives an essence of inferior quality, which is especially used preparation of varnishes and costs usually only from 2*s* 10*d* to 3*s* 7*d*). In the belt where *Lavandula vera* and *L. spica* are neighbours, ers have always found another species which they call "bastard der" and which yields a very inferior essence. M. Chatenier has ized this bastard lavender to be a hybrid of *L. v. fragrans* and *L. phinensis* with *L. spica*.

Essence of lavender. — The essence is especially concentrated in flower, the peduncle containing only a very small quantity of it. harvesting, however, this peduncle is cut at a length of about 4 to 6 inc close to the first leaves. The composition of essence of lavender is comp It owes its perfume to several bodies; it contains also some compou which diminish its value to a varying degree according to the origin the amount of care bestowed upon the distillation. It is admitted t the fundamental element of the perfume is an ether of linalol, the ace of linalyle $CH_3COO.C_{10}H_{15}$. The amount of this ether contained in real essences of lavender produced in the South-East of France is in s localities 40 to 42 per cent., while it sinks to 22 per cent. in less favour situations.

Influence of altitude, aspect and nature of the soil. — In the cultiv state the two real lavenders thrive and acquire enormous development e on the sea coast, as is proved by some tests. The essences from pl gathered well below 1300 feet have commanded the same prices as t prepared from natural lavenders growing at medium heights. As seems to exert an influence on the quantity and quality of the essence duced, but its effect unites with that of altitude; it remains to be obse in cultivations at lower elevations. As to soil, lavender seems not t very exacting.

Creation of a lavender field. — M. Cornillac has planted a lavender of 25 acres at about a mile from Valence. The soil is sandy with a deal of stones and gravel; the subsoil, which begins at a depth of 16 t inches, consists of big stones, gravel and building sand. The whole is a subject to drought and of a low value for farming. The land was plou to a depth of 16 inches and the lavender was planted, between Nove 15 and the end of February, in rows 46 inches apart, and the plants a inches in the rows. These were transplanted from an altitude of feet: almost all of them struck, less than 1 per cent. failing. The contains 105 000 plants, which cost delivered at the field 4*s* 4½*d* hundred. The men were paid 2*s* 9 *d* per day.

The cost of the whole field was:

	£	*s*	*d*
Ploughing	25	1	3
Purchase of plants	230	3	4
Compost and manure	11	17	11
Planting	41	2	4
Total . . . £	308	4	10

or £ 21 9*s* per acre.

It is especially to be noted that the young plants cut with the pru scissors, shoot forth again easily and that for this result it is of the gre importance to keep the field free from weeds during the first year.

Sometimes, in planting a new field, old stocks are used; they are div into pieces and planted, but their striking is uncertain. Young pl

lso be obtained by sowing in a nursery. M. Cornillac has most success- tried this method. The subsequent cultivation consists in hoeing two ree times. The first year the flowers that appear are suppressed so as o exhaust the plants by allowing them to produce seed.

Lavender and truffle oaks. — The writer mentions several remarkable iments on the growing of lavender in truffle producing oak plantations.

Regeneration of natural lavender fields. — Many landowners have com ed to regenerate their natural lavender fields by ploughing them in a way as to leave only the plants in lines about 3ft. 3 in. apart.

Artificial manures. — Experiments hitherto made allow the conclusion drawn that the use of artificials increases the quantity of flowers; the in essence seems also to increase, and the quality of the perfume does eem to be impaired.

Yield of a planted lavender field. — The writer, agreeing with M. Zacha- z, states that an acre of lavender, planted in a favourable locality and ired with artificials, produces in ordinary years as follows :

st year	Insignificant crop				
nd »	1784 lbs. of flowers	yielding	12.5 lbs.	of	essence
rd »	3122 »	»	21.5	»	»
th and following years . . .	4460 »	»	31.2	»	»

Thus at the average price of 10s per lb. the gross returns of a lavender after its fourth year would be about £15 10s. The cost of gathering : more than 5 ½*d* per hundred pounds. The cost of distillation is about *d* per lb. of essence. The cost of hoeing and of manuring is about 2*s* per acre. All the expenses together are within £3 12*s*. Thus the eturns are about £12 per acre.

Diseases of lavender. — The two most important, dodder and rot, are nuch to be feared.

- On an *Allium* from the Mediterranean Region which might be used as Vegetable. — TRABUT, L. in *Revue Horticole*, Year 85, No. 13, p. 311, 1 fig. aris, July 1, 1913.

Allium triquetrum L. is well known along the Algerian coast, especially e neighbourhood of dwellings and in gardens, and is very much appreci- by the Berber population, who use it in large quantities during the winter. culinary experiments of the writer have shown that the entire plant ɔe used to replace other vegetables in the winter months. Its leaves are tender when cooked and of good flavour.

The writer has also experimented with the cultivation of this onion; ound it necessary to plant the bulbs towards the end of summer at a h of from 15 to 20 cm. (6 to 8 in.) in order to obtain a good substitute eeks. The bulbs planted separately and deeply in good soil produce : plants in the winter, the portion below ground being blanched, very er and appetising. With the green leaves removed they constitute xcellent vegetable free from all smell of garlic or leek and compatible

with any sauce. The writer has no hesitation is recommending this veg able thus treated as a most interesting acquisition to gardens on the bor of the Mediterranean.

1158 – **The Sexual Organs of Vine Hybrids.** — GARD, M. in *Comptes Rendus domadaires des Séances de l'Académie des Sciences*, Vol. 157, No. 3, pp. 226-228, P July 21, 1913.

I. In the cases of the male flowers (with long stamens) and the her phrodite flowers (with short recurved stamens), the pollen of the wild cies is normal, the proportion of the empty grains not exceeding 10 to per cent. In cultivated selected varieties, however, a larger degenera was noticed, the empty grains amounting to 50 per cent. and upward

II. In the cultivated European vine two cases occur : 1) the polle often normal ; 2) it consists of three kinds of grains: empty, normal and termediate. According to the vine, sometimes the number of the two are equal, sometimes one or other predominates, but the full grains generally the most numerous.

In the wild varieties, as in the cultivated, the cases where the po is normal are more numerous than those where it is degenerate. We h no information as regards the causes of this degeneration.

III. The pollen of double hybrids is always modified, through to a var degree, in the case of males, hermaphrodites with long stamens and her phrodites with short stamens. Often grains occur which are small, deform of abnormal appearance, not swelling in water, and with a very varied tent resembling in optical section (like those of some cultivated vine cap, a crescent, or a crown.

In three-quarter, triple and quadruple hybrids there are also consi able differences according to the hybrid examined; the proportion of em grains may be nearly normal or very great. The quantity of pollen can present great variations.

The female organ, on the contrary, is as perfectly formed in hyt as in species. The embryo-sac is never lacking in the ovules, and the are on the average more numerous than in the case of the parents.

IV. The pollen of short stamens, has, as is well known, very diffe morphological characters from that of the pollen of long stamens. F the cytological point of view, the writer has observed in the former a generative cell and a vegtative nucleus similar to that occurring in latter, while the deformed grains which are nearly or quite empt both cases lack a generative cell, or in any case the nucleus of the l has degenerated.

Although not sterile as was supposed, the pollen of the short stame considered incapable of fertilizing the pistil of the same flower. The w has proved the truth of this statement as regard *V. cordifolia*, Jac d'Aurelles, Blue Favourite, Massassoit and Black Eagle, while in the l stamened flowers the pollen is fertile to the pistil of the same flower (1).

(1) See No. 1430, *B.* Oct. 1912.

V. The facts presented by the sexual organs of vine hybrids are thus
an exception to those already known, and do not agree with the state-
ts of M. Couderc. The male elements are altered to a more or less
iderable extent, while the female organs remain intact, according to the
that ovules which occur in small numbers undergo no degeneration.
Mr. Booth has described two distinct forms of pollen, the one fertile
the other infertile, independently of the length and habit of the
ens, and which may occur together in certain American vines. They
oubt correspond to the normal and altered grains of hybrids and of
original vines. Their occurrence in the varieties studied by the writer
surprising matter, seeing that the former are natural hybrids, though
fact is denied by a certain American school which is under the
ence of Engelmann's ideas.

- **The Reconstitution of Swiss Vineyards.** — FAES, H. in *Revue de Viticulture*, ear 20, Vol. XL, No. 1026, pp. 210-213. Paris, August 14, 1913.

In the spring of 1912, the Canton Vaud used in the reconstitution of ineyards 1 371 250 meters (1) of "grafting wood", of which 194 150 m. furnished by the Cantonal nurseries. The following were the varimost in demand: Riparia × Rupestris 3 309 (625 300 m.), Riparia × estris 101[14] (300 400 m.), Riparia × Rupestris 3 306 (137 750 m.), rvèdre × Rupestris 1202 (99 500 m.), Berlandieri × Riparia 420 A 50 m.). The vintage of 1911, which was good on the whole, influenced grafting of the spring of 1912 and gave rise to a greater demand of ing wood (1 096 985 m. in the spring of 1911). A "grafting depart-t" was carried on as usual at the Champs-de-l'Air Vine-growing Station.

In considering the vineyards in Switzerland which have been recon-ted on American stocks, it is possible, taking them as a whole, to arive rtain conclusions; though these may not be final, they are sufficiently factory to permit of the work of reconstitution being continued with a in amount of security.

At the beginning of the reconstitution operations, Riparia Gloire de tpellier and Rupestris were used amongst other "pure American stocks" a certain number of vineyards. Subsequently, Americo × American Franco × American stocks have been substituted for those first planted now tend to entirely replace them.

In the Canton of Geneva, it is found that Riparia Gloire, when planted, good situation on deep, damp, slightly calcareous soil produces regular good crops. It has, however, the defect of sometimes losing its vigour, after four or five crops, if it is planted in less fertile, although deep soil. thought that the hybrids give better promise, especially as regards tion.

At Neuchâtel, Riparia Gloire has proved to be prolific and has grown a fine plant on certain rich, deep soils poor in lime. But these special

(1) One meter = about 3 ft. 3 in. (*Ed.*).

soils are very rare in the district, where most of the soil is dry and shallow
Riparia, also, has never been a favourite in this Canton.

In Ticino, Rupestris is being given up, as its wood ripens badly, esp
cially in cold, wet seasons. It is also believed to have been observed th
during severe winters, plants grafted on Rupestris suffer from frost mo
than do other vines. With regard to Riparia, the latter stock gave fa
results in the southern part of the Canton, where the reconstitution wo
was begun on the best soils of the district. Disappointment, however
followed in the Lugano neighbourhood, where the soil of the vineyards
more stony. It is recorded that here also Riparia is abnormally productiv
at first, but soon perishes, all the more owing to the long pruning adopte
in order to obtain a larger crop.

In the Canton Vaud certain soils have been found to be perfect
suitable to either Riparia or Rupestris. But in consequence of the sho
pruning practised in the Swiss vineyards, this latter stock tends frequent
to promote the vegetative growth of its scion at the expense of the fru
which causes the grapes to ripen late. Riparia Gloire has proved especia
unsatisfactory on a heavy, cold type of soil, such as that often present
by glacial clays, irrespective of the amount of lime present.

Americo × American stocks, and especially Riparia × Rupestris,
being increasingly substituted for pure American stocks, owing to th
greater powers of adaptation. Riparia × Rupestris 3 309, 101[14], 3
and 11-F form at the present time the basis of reconstitution in most
the Swiss vineyards with poor or average soil ; of these the two former
by far the most common. So far, the said stocks have given satisfact
in the majority of cases. Solonis × Riparia 1 616, a hybrid much in dema
only a few years ago, is now out of favour, as it is considered, perh
wrongly, to possess insufficient power of phylloxera resistance. In
Canton Vaud, for instance, Riparia × Rupestris 101[14], which has alre
been planted in numerous vineyards, is without doubt a stock suitable
many average, rather heavy, and even heavy soils. It should not
planted in very light dry soils, or in those wanting in depth, for it is ea
affected by drought. It nearly always prefers somewhat heavy soils
very light ones. This vine must not be grown in tufaceous soil, or in
careous marls, as its resistance to calcium carbonate is not sufficient
allow of its normal development in soils of this nature.

In the same district, Riparia × Rupestris 3 309 gives excellent res
on a large variety of soils, and replaces the Lot variety on gravelly and li
soils. The writer has often seen magnificent specimens of this vine, cove
with fruit, growing on the gravelly soil of the Aigle district. On the ot
hand, 3 309 having been quite recently introduced into Switzerland,
plantations on this stock are, as a rule, younger than those grafted on ot
When their progress has been followed for a few more years, it will be
sible to decide authoritatively upon the type of soil best fitted for this v
which is much in request now-a-days.

The Canton of Neuchâtel has proved especially suitable to Rip
× Rupestris 3 309.

In the Canton Ticino, Riparia × Rupestris 101[14] has gained the ır of the vine grower. Its adaptability to vineyard soils of different ositions in that district is relatively great; its growth leaves nothing desired, and its fruit-bearing property is well developed. Riparia × stris 3 309, which has recently been introduced, especially on dry soils, appears so far to be suitable also to the Ticino vineyards.

As regards the Franco-American stocks, Aramon × Rupestris 1 and vèdre × Rupestris 1 202 have been planted, but very few Chasselas × ndieri 41-B. Franco-Americans have especially been used on act calcareous soils, even when damp, where other stocks would not

At Arnex-sur-Orbe, in the Vaud vine district, there are very stift reous marls containing a uniform amount of from 40 to 60 per cent. ry fine carbonate of lime. The whole series of Riparia × Rupestris, lis × Riparia 1616, the pure Americans, Riparia Gloire and Rupestris ot perish very quickly on such soils. Only Aramon × Rupestris 1, especially Mourvèdre × Rupestris 1202, which is still more chlorosis-ant, have given results which can be called favourable. It is also in-ting to observe that hitherto in the Arnex vineyards, which are much ted with phylloxera, where this insect has done great damage since the above-mentioned Franco-American stocks proved sufficiently phyl-a-resistant, while the young vines of the country which had been ed along side by persons hostile to the new methods, succumbed in a few years to the persistent attacks of the insect.

In general, however, the present tendency in Switzerland is to reduce number of Franco × American stocks used, as the reproaches levelled st the vines grafted on Rupestris du Lot are still more merited in the of grafts upon Aramon × Rupestris and Mourvèdre × Rupestris 1202. e stocks have often a marked inclination to over-stimulate the vegeta-growth of their scions; they run too much to wood. Some long me-s of pruning occasionally remedy this defect, but produce large crops h are liable not to ripen well, especially in cold seasons. A delay in ning is nearly always noticeable, under Swiss climatic conditions, in s grafted on Mourvèdre × Rupestris 1202 or Aramon × Rupestris 1. fact would not be of much importance if it were only a question of quantity of the grapes, but the Swiss vine-growers are very tenacious aintaining the quality of their local wines.

At the present time, many experiments are being made as to the possi-y of substituting, especially in the case of choice vineyards, Berlandieri tids for the above-mentioned Franco × American stocks. Riparia × andieri 420-A, and 157 157[11] have been most used; 34 E M and Chasselas Berlandieri 41-B appeared weaker. There still remain to be tried the ks of the Hungarian Riparia × Berlandieri Teleki series, of which some n worthy of experiment.

Owing to the fact that the Berlandieri variety was accustomed to a hot climate, the preconceived idea still prevailed only a few years ago that n the hybrids of this vine would not succeed in Switzerland. But in the erimental vineyards, the Berlandieri hybrids now bearing produce a

crop which is relatively satisfactory, both as regards quantity and quali even when growing in fairly northern situations, such as the Bernese vi district on the shore of the Lake of Bienne. No doubt, during the fi few years, the vines which have been grafted on these stocks do not devel as vigorously as their neighbours grafted onRiparia × Rupestris or Aram × Rupestris 1 and Mourvèdre × Rupestris 1202, but they quickly ma up for lost time and begin to bear. Vineyards which have been replan with Berlandieri hybrids deserve to be studied and closely observed, b on the other hand they are not sufficiently numerous to allow of any comp hensive opinion being formed upon their value in the general reconstitut of the vineyards of Switzerland.

1160 – **Manuring of Coconuts in the Seychelles.** — RIVALTZ DUPONT. Contribu à l'étude du Cocotier aux Seychelles. — *L'Agriculture pratique des pays chauds*, Year No. 122, pp. 345-355. Paris, May 1913.

The quantity of mineral matter removed from the soil by the cocon is considerable when the fibre and leaves are not returned. The copr itself represents a very small proportion, only about one-fifth of this quanti It is therefore desirable to utilise the leaves and other residues before con dering other manures. The writer has studied the coconut fertilisers u on the two types of soil in the Seychelles.

1) *Madreporitic soils.* — They occur in the outlying islands, which extremely fertile owing to deposits of guano having the following co position.

Moisture	7.20
Organic matter	12.50
Lime	44.30
Magnesia	1.70
Potash	0.38
Phosphoric acid	30.85
Sulphuric acid	0.69
Silica	2.06
Iron, alumina, etc.	0.36
	100.04

There is a deficiency of potash, but according to Boname the cocon utilises considerable quantities of sodium salts during the growth of the florescence, and it appears that less potash is consumed and the two ba are interchangeable in the requirements of this plant.

2. *Granitic soils.* — These soils require neutralising with lime or gua Potash is generally deficient in soils that have been cultivated for a le time. Phosphoric acid is supplied economically by the guano, which co only 16 to 24 *s* per ton at Victoria.

Potash manures. — Sulphate of potash should be prefered, as the u of potash in it (at Bombay or Colombo) costs only 4*s* 9*d*, as compared w 7*s* in kainit. The writer recommends the application of 45 to 90 lbs. acre buried in trenches round the trees.

Nitrogenous manures. The writer recommends green manures (*Tephro candida*, etc), seaweed and farmyard manure where possible. An excell manure for coconuts could be obtained by the organisation of fisher

The Forests of Taiwan (Formosa). — THE GOVERNMENT GENERAL OF TAIWAN, Statistical Summary of Taiwan, pp. 21-24, 429-430. Tokyo, 1912.

The Island of Taiwan is rich in forests and in unreclaimed lands on borders of those forests. Its total area, including the beds of rivers, 888 sq. miles.

General Conditions of Forests. — The forests of Taiwan comprise, g to the high altitudes of some of the mountains and to great tions in meteorological conditions, all kinds of vegetation belonging opical, subtropical, temperate and even to subalpine climates. The ts in the civilized part of the island had under the Chinese rule been to a extent cleared of trees. Of late years, however, reforestation has been naged and a great improvement is already noticeable. The lands n the frontiers of the savage tribes are nearly all covered with eval forests in which abound « obtuse ground cypresses » (*Chamea- is obtusa* Sieb. et Zucc.), camphor-trees and « pointed oak » (*Quercus ta*).

Preservation forests. — The utilization of forests in Taiwan is still in e of infancy. As for the official exploitation of forests, the camphor try is the only enterprise worth mentioning. Nevertheless the indis- nate felling of trees for purposes of reclamation has caused grave fears se as to the proper caring for the river courses. It follows that while it irable to secure increased exploitation of forests, it is important to set certain preservation forests in the catchment basins. The Govern- General is therefore establish'ng such forests. Their area amounts ly to 59 092 acres.

Lease or sale of government forests or wild lands. — The largest number h transactions formerly took place under the Regulations for the Pro- al Sale of Forests and Wild Lands, the total area disposed of in this p to the close of 1910 amounting to 134 750 acres. Next in area come dealt with according to the Regulation for the Encouragement of the ation of Camphor Trees. In 1911, however, more forests and wild were sold under the latter regulations than under the former. The area of forest and waste land sold and leased from the beginning up e end of 1911 amounted to about 310 660 acres.

Afforestation and nurseries. — The Government is not only conducting station on its own account, but is giving encouragement to private s to engage in the same work. The trees thus planted consist of cam- trees, *Acacia confusa*, Merril, pines, cryptomerias and other needle- l and broad-leaved trees. At the close of 1911 the total afforested was about 39 200 acres.

Forestry Experiment Stations. — Owing to the special nature of vege- t in the island, the Industrial Section of the Department of Civil s established in May 1911 the Forestry Experiment Station at ku with two branch stations. According to its regulations the n is to carry out the following work :

1. Investigation and introduction of useful plants both from Japan and other countries.

2. Investigations and experiments connected with afforestation, as well as the exploitation and preservation of forests.

3. Improvement of seed ings and their distribution.

Training of forestry experts. — The primitive state of the fore industry in Taiwan induced the Government in 1908 to commence tr ing men for the work, so that every year fifteen experts may be supplie the Local Government and to private parties.

In 1910 Rules for Investigating Forests and Wild Lands were iss according to which the surveys and investigations of forests are b actively carried out.

Arisan forests. — These famous forests, which are being exploite the Government of Taiwan, are situated within the savage land limits comprise a total area of 26 950 acres containing timber estimated at 200 million cubic feet. The forests are found at altitudes ranging betw 2800 feet and 8700 feet above sea-level and are reached by a forest rail 41 miles long, from the main line. The exploitation of these forests originally started as a private undertaking but was transferred to Government through purchase in 1910. In the lower parts of the fo are found camphor-trees, oak, *Alnus maritima* Nutt. var. *Forma* Burkill, *Machilus Thunbergii* S. and Z. and *Quercus cuspidata* Thu which are broad-leaved; in the upper portions occur the conifers: *maecyparis Formosensis* Mats, *Ch. obtusa* S. and Z. form *Formosana* mixed with cedars, *Pinus Formosana* Hay, *Tsuga Sieboldii* Carr. Government has adopted the plan of entirely renovating the Arisan fo in thirty five-years by felling certain portions each year and refore them afterwards. According to this plan the average felling each will amount to 3 million cub. ft. of conifers and 1 200 000 cub. ft broad-leaved trees. A railway and a sawmill will be built, and nurs have been laid out on 17 acres.

Camphor industry. — As has already been stated the principal z zation of the forests of Taiwan has been by the extraction of camp organized as a State monopoly. The Island's Monopoly Bureau 7236 810 lbs. of camphor abroad and 1 137 780 lbs. to the refiners in Ja together valued at about £ 489 300.

It is undoubted that the camphor industry has suffered more or as the operations for the better control of aborigines progressed; but output of the year did not fall short of the estimates, the figures being 5961 lbs. of crude camphor and 7019 896 lbs. of camphor oil. Of these the ac amounts received by the Monopoly Bureau were: crude camphor 6071 lbs. and camphor oil 7 514 489 lbs., which were less than the receipts for previous year by 1 425 622 lbs. crude camphor and 1 019 732 lbs. of camp oil. Up to 1911 the work of distillation was conducted entirely by pri firms under contract with the Monopoly Bureau; but as there was m unnecessary waste and inferior quality of product the Monopoly Bu began experiments in distilling camphor oil and in 1911 satisfactory distillation arrangements were completed. But as the plant is not la enough, a part of the work is still leased out to private forms as forme

- **Experiments on the Influence of Manures in Nurseries.** — CUIF, E. Research Station of the National School of Waters and Forests), in *Annales de la Science Agronomique*, Year 30, No. 6, pp. 433-454. Paris, June 1913.

The experiments of Bartet were taken up again on a new system in 1906. article describes the method of experimentation followed and gives results of some of the earlier experiments.

LIVE STOCK AND BREEDING.

- **The Cause of Fagopyrism. A Contribution to the Study of the Fluorescent Colouring Matters in the Seedcoat of Buckwheat.** — FESSLER, KURT in *Berliner Tierärztliche Wochenschrift*, Year 29, No. 28, pp. 497-499. Berlin, July 10, 1913.

After making analytical and spectroscopical investigations respecting colouring matters of the seedcoat of buckwheat, the writer is of opinion fagopyrism is caused by the crude chlorophyll.

- **On Four New Species and Two New Varieties of the Ixodid Genus *Haemaphysalis*.** — WARBURTON, CECIL in *Parasitology*, Vol. VI, No. 2, pp. 121-130. London, July 1913.

In his short introduction, the writer mentions that the examination of st number of ticks collected in late years from various hosts in many s of the world, has resulted in the addition of several new species to the s *Haemaphysalis*; the number of recognised species in this genus now hes 43.

Just as *Rhipicephalus* is proper to Africa, so *Haemaphysalis* is essenly Asiatic, and the Indian region has furnished most of the newly disred forms. One of the species described by the writer is African, the reder being additions to the Indian fauna. The difficulties presented the genus *Haemaphysalis* are chiefly due to the fact that its characare negative; the writer, however, states that there is no lack of rly defined forms and gives a diagnosis.

Detailed descriptions follow of the new varieties and species mentioned w:

Haemaphysalis aborensis (Yambung, India), *H. howletti* (Rawalpindi, a), *H. aciculifer* (Uganda), *H. kinneari* (Kanara, India), *H. cornigera* var. *nala* (India), *H. inermis* var. *aponommoides* (Belgachia, Calcutta).

Eight figures illustrate the text.

- **New Species of *Ixodes*.** — NUTTALL, G. H. F. Notes on Ticks. III: On Four New Species of *Ixodes*. — *Parasitology*, Vol. VI, No. 2, pp. 131-138. London, July 1913.

The new species described in this paper are of interest, although the writs only able to deal with females, as is frequently the case with this genus. species (*I. kempi*), allied to the North American *I. angusta*, comes from herto unexplored region on the north-east frontier of India, having been cted by the Abor Expedition. Two species, *I daveyi* and *I. oldi*, are Africa, and offer a peculiarity of structure in that they possess anal

grooves having the form of a horse-shoe, an appearance only hitherto served in three other species of *Ixodes*, all of which are African. The fou species, *I. ricinoides*, is from China and is allied to *I. ricinus*.

The writer gives a description of the following species: *Ixodes ke* (Kobo, Abor Country), *I. daveyi* (Rusvenzori, Uganda), *I. oldi* (Komatei Sierra Leone), *I. ricinoides* (Wen-chwan-hsien, China).

This article is illustrated by four text-figures.

1166 – **The Distribution of Creatin in the Bodies of Mammals.** — BEKER, J in *Hoppe Seylers' Zeitschrift für Physiologische Chemie*, Vol. 87, Part 1, pp. 1 Strasburg, August 16, 1913.

A communication giving the results of numerous analyses made ascertain the creatin and creatinin content of the organs of cow, goat, rabbit and dog. It was found that the largest amount of creatinin (314. mgm. per 100 gm. of organic substance) was present in the voluntary musc and the least (9-76 mgm.) in the thymus gland. In 100 c. c. of blood, to 2.17 mgm. of creatin was found. In the foetal condition, mamm have little of this substance, though much is present after birth. In anim in advanced pregnancy, the absolute and relative creatinin content increa The right horn of the uterus of pregnant animals contains more creatin t the left. The liver dehydrates creatin to creatinin.

1167 – **A Calorimeter for Small Animals.** — TANGL, F. in *Biochemische Zeits* Vol. 53, Part 1-2, pp. 21-35. Berlin, July 15, 1913.

This calorimeter is constructed on the same principle as Bohr and H selbalch's calorimeter devised for the determination of the heat product of the chicken embryo.

The heat production is thermo-electrically measured: the thermo-elec current produced by the increase of temperature determined by the prod tion of the animal heat is measured by comparing it with the amount heat derived from another source which produces an electric current of actly the same strength (compensation). The calorimeter in question which the construction, working and management are minutely described the writer, and of which he gives three diagrams), differs from the Bohr-Has balch apparatus in the method adopted for the thermic isolation of the cha bers containing the small animals, the isolation being made more compl by the use of Dewar flasks. The fact that the animals move during the periment was taken into account in the method adopted. Rats, mice, fr and leeches were used for the experiments. The duration was 10 to 24 hou allowing 1 to 1 ½ hour to obtain the most exact compensation, there rem 8 to 22 hours for the estimation of the heat production. The weight of body and all its excretions can be calculated to one-hundredth of a gra The writer will communicate the results of the first experiment in a la number of the *Biochemische Zeitschrift*.

The Effect of Previous Nutrition upon Metabolism during Fasting. — SCHLOSSMANN, ARTHUR and MURSCHHAUSER, HANS in *Biochemische Zeitschrift*, Vol. 53, part 4-5, pp. 265-299. Berlin, July 21, 1913.

On the conclusion of experiments on the interchange of gases in fasting ren, the writers made further investigations at the Akademische Kin- inik at Dusseldorf, in order to ascertain whether, and how far, a pre- diet confined to one substance affected gaseous interchange in a hungry The animals used for the experiment were first starved until they lost hird of their weight, which was after the lapse of 16 days; their gaseous change (absorption of O_2 and production of CO_2) was then deter- d. Then the dogs were fed up to their original weight, after which fol- another fasting period of 24 hours concluded by a respiration experi- . After the animals had taken food for the second time (for some their gaseous exchange was investigated for a third time at the of another fasting period of 24 hours. The food given during the iment was fat in the case of dog I, carbohydrate in that of dog II, and in in that of dog III.

A second experiment was undertaken by the writers for the purpose of mining in what manner metabolism took place in a dog when deprived od for some length of time. To this end, the three dogs were deprived od, and after fasting for 24, 2×24, 4×24, 7×24, 8×24, 12×24, and 24 hours, the metabolic changes were investigated.

It was found from these two experiments that the respiration quotient $\left(\frac{\text{production}}{\text{absorption}}\right)$ depends, in the case of a fasting animal, upon the substan- which have previously taken part in building up its body. The effect od of one kind upon gaseous interchange during fasting is thus discer- , even after the direct effect of the last meal has long passed away. e case of animals which have been deprived of food, anabolism is effec- n a manner corresponding to the combustion processes of the previous d. Through being fed upon a single substance, such as glycogen or he body accustoms itself to consume more or less glycogen, or more or at. In animals accustomed to an exclusive fat diet, the respiratory ent, even when they are fasting, is nearly the theoretical fat quotient; an exclusive carbohydrate diet, the quotient approaches the theoreti- rbohydrate quotient. In the case of long and continuous fasting, the nce on metabolism produced by a previous fat diet lasts longer than ffects of a carbohydrate diet, because the glycogen supply, when much n upon, is more quickly consumed than the fat supply.

By means of their diet, it is thus possible to exert a direct effect upon atory metabolism, and one which outlasts the feeding period and pre- the organisms for the task of breaking up larger amounts of fat or ycogen.

1169 – **The Influence of the Ingestion of Sodium Nitrate on Nitrogen Exchang**
GRAFE, E. and WINTZ, H. in *Hoppe-Seyler's Zeitschrift für Physiologische Chemie*, Vo
Part 4, pp. 283-414. Strasburg, July 21, 1913.

The writers summarize the results of the experiments of Barth, Röhm Binz, Gerlinger, Gérard, Oppenheimer, Harnack and others upon the e of sodium nitrate upon animal organisms.

They also give a description of their latest experiments made on a and three pigs, with the object of studying the action of sodium nitrate i creasing the amount of nitrogen eliminated by the organism. They fo like Abderhalden and Hirsch, that sodium nitrate acts in four ways:

1. There is no change in the nitrogen exchange; the nitrate is agair minated quantitatively.

2. The nitrate is eliminated quantitatively, but produces a great d nution in the loss of Kjeldahl nitrogen.

3. From 10 to 15 per cent. of the nitrate nitrogen ingested is reta in a stable form and remains in the body. At the same time, the Kjel nitrogen exchange may, or may not, be modified in a favourable ma

4. Strong doses of nitrate increase the elimination of Kjeldahlnitr

The differences in the experimental results seem principally due t amount of nitrogen administered.

1170 – **The Effect of the Iron Content of Blood Meal upon the Iron Assimil of Animals fed with it.** — GROH, JULIUS in *Biochemische Zeitschrift*, Vol. 53, I pp. 256-258. Berlin, July 18, 1913.

The writer used as the subjects of these experiments two Yorkshire weighing respectively 174 lbs. and 139 lbs. The experiment was di into two periods, during one of which maize was fed, and during the maize and blood meal. During the first period, which lasted 18 days i case of pig I, and 8 days in that of pig II, the former received daily 4. of crushed maize, and the latter 3.3 lbs. The second period was pre in the case of both animals by a preliminary feeding period of 21 days itself lasted for 10 days. During this time, the daily rations were 2.9 of crushed maize, and 0.44 lbs. of blood meal per animal. The iron co of the food and excrement were determined gravimetrically. accompanying table gives the results of the experiment:

I. — *Maize period.*

	Pig I	Pig II
	gm.	gm.
Iron ingested daily with the maize	0.425	0.3
Iron eliminated daily in the faeces	0.451	0.3
» » » » » urine	traces	trace
Balance of iron . . .	−0.026	+0.01

II. — *Maize and blood meal period.*

	Pig I	Pig II
	gr.	gr.
n ingested daily with the maize	0.283	0.283
» » » » blood meal.	1.206	1.206
eliminated daily in the faeces	1.483	1.509
» » » » urine	traces	traces
Balance of iron . . .	+0.006	—0.020

hus, in spite of the large amount of iron ingested, the animals did not late an increased quantity of this substance.

The Relation of Growth to the Chemical Constituents of the Diet. — BORNE, T. B. and MENDEL, L. B. in *The Journal of Biological Chemistry*, Vol. XV, o. 2, pp. 311-320. Baltimore, Md., August 1913.

number of charts are given showing the results of further experiments feeding of rats on variously prepared foods. In conformity with the s obtained previously, both by the writers and other investigators: a milk food (in the form of a paste consisting of 60 per cent. of milk er, 12 per cent. of starch and 28 per cent. of lard) diet was capable of ying rats with the necessary elements for both perfect growth and main- ice, the specially prepared "natural protein-free milk", or artificial rations from pure chemical substances made to imitate closely the com- ion of the "protein-free milk", though capable of supplying the elements ired for maintenance failed to produce perfect growth. Young rats fed hese diets developed normally up to a certain point, and then sooner ter succumbed, but recovery always took place if milk food was added ie rations.

While all the available evidence makes it extremely improbable that difference in the relative efficiency of these foods is due to the proteins, rbohydrates and inorganic elements are essentially alike in all, and all been subjected to the same amount of heating. But the inefficient lack those components of milk which are separated in the centrifuge or ed by filtration (cream and any cellular elements) during the prepara- f the "protein-free milk". In order to investigate the influence of rmer of these factors, unsalted butter was added to the diet of rats n "natural" and "artificial protein-free milk". This proved to the same restoring effect as the milk food, and experiments are now conducted to investigate the matter more thoroughly.

Sorghum Crops for Silage. Feeding Experiments with Dairy Cattle. — EED, O. E. and FITCH, J. B. — *Kansas State Agricultural College, Experiment Station* ircular No. 28, pp. 6. Kansas, 1913.

Sorghum crops, both saccharine and non-saccharine, can be used for si with good results. The corn plant has considerable prestige as a silage , and has been more generally used for this purpose in Kansas than any r. As in most parts of Kansas the yield of sorghums, such as kafir sweet sorghum, is considerably larger than that of corn (maize), it was ght that if these crops could be made into silage, they would be of par-

TABLE I.

LOT. I. — *Four cows. — Twenty-day periods.*

Period	Milk	Butter fat	Body weight
	lbs.	lbs.	lbs.
1. Corn silage in ration	1 337	55	4
2. Cane silage in ration	1 252	51	4
3. Corn silage in ration	1 178	49	4
Average. – 1st and 3rd periods corn silage	1 257	52	4
2nd period cane silage	1 252	51	4
Difference	5	1	

LOT. II. — *Four cows. — Twenty-day periods.*

1. Cane silage in ration	1 192	54	4
2. Corn silage in ration	1 167	51	3
3. Cane silage in ration	989	46	4
Average. – 1st and 3rd periods cane silage	1 091	51	4
2nd period corn silage	1 167	51	3
Difference	76	—	

ticular advantage to the farmers and stockmen of the western district w corn is grown with much difficulty and uncertainty. Therefore, two y ago, the Dairy Department of the Kansas Agricultural College planne experiment to determine the value of sorghums for silage.

The first sorghum crop put into the silo was sweet sorghum, comm called cane. If the cane is put into the silo three weeks after corn silo made, it is found that the former does not contain as much acidity as silage. The cane used in this experiment was grown on upland soil on College farm, and the sorghum crop was larger than the maize crop, w occupied part of the same field.

In the following year 1912, one silo was filled with cane, one with and one with corn; here again the same results were obtained with the as before. It made a good quality of silage containing less acid than corn silage.

1911-1912 the first feeding experiment was made with milch cows, age being compared with corn silage. Two lots of four cows each were l for the experiment.

it I were fed for the first twenty days on corn silage. For the second s (after an interval of 10 days), they were fed on cane silage. After r intervening period of 10 days the third twenty-day period began, when ws were again fed on corn silage. The animals in lot II were fed cane luring the first period, corn silage during the second period and cane luring the third period. It was planned to get a direct comparison of wo feeds by comparing in each case the average of the first and third with the second period. Cows gradually decline in milk yield, and the e production of the first and third periods would naturally be about o the production of the second period. These cows were fed a grain ıay ration in addition to the silage; the hay ration was kept constant, e grain ration was fed in proportion to the amount of milk produced, remained practically constant. The only change, then, in the ration the experiment was the change made from one kind of silage to the The table on the opposite page gives the results of the experiment. studying the table of results on lot I, we find an increase in live weight the cane silage feeding period; this increase is also observed on averages of the first and third periods, while the increase in milk tter fat production during the corn silage feeding is so small as to be ble.

ıt II gave similar results. The corn silage produced more milk and fat than the cane silage, while the cane silage caused gains in live weight. ılts of the whole experiment suggest that cane silage is more fatten- ın corn silage.

ıring the winter of 1912-1913 a feeding experiment was conducted fteen dairy cows, in which comparison was made of the respective of three crops for silage: kafir, cane and corn. The general plan of the nent was similar to that of the preceding year. Fifteen cows were l into three lots. Lot I contained six cows which were used to compare lage with corn silage, lot II consisted of five cows fed on cane and kafir while in lot III four cows were used to determine the comparative of corn silage and cane silage. The cattle in each lot were fed for three s of 30 days each with a ten-day period intervening between the first ond periods, and also between the second and third periods. The experi- ıcluded only the 30 days in each period. Table II gives the results second trial.

ıe results of the experiments in Lot I indicate that corn silage is y superior to kafir silage for milk production, while kafir silage proved ore fattening.

ı the second lot, kafir silage proved much better than cane for milk tion. The cows made a very slight gain in body weight while on the lage.

ı the third lot, corn proved superior to cane silage. The former ed a larger milk yield and a very slight gain in live weight.

TABLE II.

LOT I. — *Kafir Silage versus Corn Silage.*
(Six Cows — Thirty-day periods).

Period	Milk	Butter fat	Body w
	lbs.	lbs.	lbs.
1. Kafir silage in ration	3 373	142	6
2. Corn silage in ration	3 383	140	5
3. Kafir silage in ration	3 339	139	6
Average 1st and 3rd periods, kafir silage	3 356	140	6
2nd period, corn silage.	3 383	140	5
Difference . . .	27	—	

LOT II. — *Cane Silage versus Kafir Silage.*
(Five cows — Thirty-day periods).

1. Cane silage in ration	2 384	107	4
2. Kafir silage in ration	2 492	112	4
3. Cane silage in ration	2 139	98	4
Average 1st and 3rd periods, cane silage	2 261	102	4
2nd period, kafir silage	2 492	112	4
Difference . . .	231	10	

LOT III. — *Corn Silage versus Cane Silage.*
(Four Cows — Thirty-day periods).

1. Corn silage in ration	1 953	89	3
2. Cane silage in ration	1 832	86	3
3. Corn silage in ration	1 852	85	3
Average 1st and 3nd periods, corn silage	1 902	87	3
2nd period, cane silage.	1 832	86	3
Difference . . .	70	1	

summing up the work of both trials, the following conclusions may wn.

1. Corn silage is slightly superior as a milk producer to silage made from kafir or cane.

2. Kafir silage ranks second as a feed for milk cows.

3. Cane silage ranks third as a milk producer.

both trials the cattle gained in live weight on cane silage more readily m silage made from kafir or corn. This fact would indicate that the contains more carbohydrates and sugar, or fattening substances, he other feeds. In the writers' opinion, cane silage would prove the of corn or kafir silage if more protein and less fat-forming nutrients ed in the grain ration, so that the animal could use the nutrients more nically.

lthough kafir and cane silage were shown by the experiments to be y less valuable than corn silage, there are other factors that must be ered; namely yield and adaptability to local conditions. Without , the greater yield of cane and kafir to the acre will offset the slight se in feeding value to be obtained from corn silage. Kafir and cane ought resisting crops, they can be grown over a wider teritory than and yield from one-third to one-half more tonnage to the acre.

During both trials the acidity of the cane silage was never more than that corn silage. In the second trial the average acidity for the three dif- kinds of silage was as follows : corn, 2.03 per cent.; cane, 1.46 per cent. 1.43 per cent.

t was also noted during the experiment that most of the cane seed and at amount of the kafir seed passed through the animals undigested. suggests that the nutritive value of these crops as silage is limited to f the stalks and leaves. The quality of silage obtained from all three was very good. The kafir silage was perhaps the poorest on account of its immature. The cows eat the silage with relish, and appeared to pre- e cane silage.

The silage was stored in wooden-stave and in cement silos, and kept lly well in either case. The time of cutting cane and kafir is all-im- nt in making good silage from these crops. They should be practi- mature; that is the seed should be ripe. If cut too green the silage is After a heavy frost, the crop should be cut and siloed immediately. dries out too much, sufficient water should be added to enable it to well.

– **Manioc Roots and the Residues of their Elaboration.** — KLING, M. in *e Landwirtschaftlichen Versuchsstationen*, Vol. 82, Part 3-4, pp. 211-233. Berlin, uly 17, 1913.

From the roots of the manioc (*Manihot utilissima* Pohl) two kinds of h flour are obta'ned, one of wh'ch 's used as an art'cle of d'et, wh'le the r 's the starch (*Appreturmittel*) of commerce. Recently, the residues of industry have also made the'r appearance on the market, especially in orm of cattle feeds.

TABLE I. — *Composition of dried manioc roots.*

Constituents	Fresh material — per cent.	Dried material — per cent.
Moisture	11.28	—
Crude protein	1.35	1.52
Crude fat	0.27	0.30
N-free extract	83.27	93.86
Crude fibre	1.98	2.23
Ash	1.85	2.09

TABLE II. — *Composition of the starch made by Messrs. Zwick & Sons of Neustadt.*

Constituents	Fresh material — per cent.	Dried material — per cent.
Moisture	10.85	—
Crude protein	1.53	1.72
Crude fat	0.38	0.42
N-free extract	83.68	93.86
Crude fibre	1.55	1.74
Ash	2.01	2.26

Manioc is cultivated in the Malay Peninsula, in Africa, in So America, and especially in Java.

The residues of the Javan tapioca, called "tapioka ampas", find t way, like tapioca itself, to the European markets. The tapioca expo from Java in 1907 amounted to 21 000 tons, and in 1907 to 44 000 tons.

The Javan manioc roots which are only suitable for making commer starch are sent to Germany and used as raw material, chiefly by the of Zwick and Sons, of Neustadt a. d. Hardt. The residues of this proc appear on the German market under the names of "Stärkefuttermeh (Starch feeding meal) or "Futtermehl Z" and "Stärkeschlempe". the European feeding-stuffs trade the manioc root residues are also kn as "Hollandisches Futtermehl", Tapioka-Ampas", "Strumbin", "Stä

TABLE III. — *Composition of the « Stärkefuttermehl » of Messrs. Zwick and Sons of Neustadt.*

Constituents	Fresh material — per cent.	Dried material — per cent.
ire	10.93	—
protein	3.59	4.03
fat	0.74	0.84
e extract	75.95	85.27
fibre	6.10	6.84
. . . . .	2.69	3.02

TABLE IV. — *Composition of the « Stärkeschlempe » of Messrs. Zwick and Sons of Neustadt.*

Constituents	Fresh material — per cent.	Dried material — per cent.
ure	86.56	—
e protein	0.25	1.86
t fat	0.03	0.22
ee extract	12.04	89.58
e fibre	0.78	5.81
. . . . .	0.34	2.53

ll.", "Pflanzenmehl", "Schlempemehl" and "Webco". These dues are also often mixed with differend meals used as feeds.

No reliable data existed as to the chemical composition of the manioc s, starch-meals, and residues of the roots. For this reason, the writer le the analyses given in the accompanying five tables.

The writer has also made a detailed analysis of the composition of the lioc roots. When well cleaned, they generally contain a little less moist- protein, fibre and ash, but a little more fat and nitrogen-free extract n are given in Table I. The analyses show that the roots, like the resi- s derived from them, are poor in protein and fat, and that their food e depends chiefly upon their starch content. No experimental data are ilable as to their digestibility. The carbohydrates, especially the starch, he "Stärkefuttermehl" ought to be easily digested.

TABLE V. — *Percentage composition of the manioc root residues known as « Stärkeabfall » and « Pflanzenmehl ».*

Constituents	Fresh material		Dried material	
	Stärkeabfall — per cent.	Pflanzenmehl — per cent.	Stärkeabfall — per cent.	Pflanzenmehl — per cent.
Moisture	10.3	11.68	—	—
Crude protein	1.12	1.25	1.25	1.4
Crude fat	0.12	0.21	0.13	0.2
N-free extract	80.25	76.60	89.46	86.7
Crude fibre	5.62	4.06	6.27	4.6
Ash	2.59	6.20	2.89	7.0

Amongst the residues analysed, the "Stärkefuttermehl" prepared b Messrs. Zwick & Sons possesses the greatest feeding value. The writ puts it at about £7 a ton, that is about the same as potato flakes. If t starch value of potatoes is taken at 77 per cent., that of the "Stärkefutt mehl" would be 70 per cent.

It is recommended to feed this product mixed with substances containi fat and protein and should these be poor in lime, phosphate of lime shou be added. "Stärkefuttermehl" should be an especially suitable feed f calves. From the point of view of the dry matter, "Stärkeschlempe is equal to "Stärkefuttermehl", but it has the disadvantage of not keepi longer than 14 days. The writer recommends "Stärkeschlempe" especial for pigs; it can be mixed with nitrogenous and fatty substances and thos containing lime. Wet "Stärkeschlempe" costs about 3*s* per bushel, a pri which nearly corresponds to its actual feeding value, when the cost of carti is not very high. As for the value of the other similar commercial produc what has already been said as regards "Stärkefuttermehl" holds goo Much care is required in purchasing these products, which are often ad terated by the addition of over 40 per cent. of carbonate of lime.

1174 – **The Show of Breeding Stock at Souk-Ahras, Algeria.** — MELLIS, C *La Revue des Colons de l'Afrique du Nord*, Year 2, No. 23, pp. 362-361; No. pp. 379-383. Algiers, June 1913.

At the second show of breeding stock organized by the Breeders' Syn cate of Souk-Ahras, held in May 1913, a thousand animals were entere of these, 560 were awarded prizes.

The class for pure Tarentais cattle was good; the animals seem not have lost anything in milk production or general characteristics in their r home, though they are somewhat darker and more irregularly marked.

The native cattle were chiefly of the Guelma breed, common in the ntainous parts; these animals are of a bright gray colour, with body pact and meaty, legs short, chest deep and wide. The cows are fairly milkers; they cross well with Tarentais bulls.

The cross-bred Tarentais × native cattle showed a great improvement those of the previous year. Three-quarter-breds are difficult to dis- nish from the pure Tarantais; the half-breds too, especially the bulls, r a predominance of the Tarentais blood, being quite distinct from native cattle in the high-set-on tail, wide hips and other characters; rs at one year may weigh 550 lbs., and at two years 660 lbs. The er believes this cross will be a success and will keep on improving r careful management and feeding.

Modifications in the Exterior Conformation of the Half-Blood Horse during Growth, in Prussia. — WÖLTZ, W. in *Landwirtschaftliche Jahrbücher*, Vol. XLIV, Part 3, pp. 409-436. Berlin, May 1913.

It is some time since the writer pointed out the necessity of having surements made on animals during the period of growth with the object letermining the intensity of development of the several parts of the y. A great number of measurements have been taken, especially the basis of Lyotin and Nathusius' works and systems, on adult nals, but there is a great scarcity of such data on animals during wth. After mentioning the work done in this connection by Gisler, ckley, Schröder and Schöttler, the writer reports upon the systematic surements made by him since August 1908, upon seven half-blood of East Prussia, about 6 months old. In August 1909 and 1910 the surements were repeated upon the same animals. Thus the foals were sured at the successive ages of 6, 18 and 30 months.

Immediately after they were purchased the animals fell sick of glandular mmation, which for a certain period retarded their development; rtheless they were well cared for and their food was especially rich.

The measurements were most carefully taken so as to exclude errors ar as possible.

Some inacccuracies, however, must be considered inevitable, especially certain measurements (thus for instance the length of the neck) which difficult to take on young spirited horses. But taking an average of figures obtained from seven animals tends to produce a compensation eventual errors. Especial difficulties were encountered in measuring length of the fore and hind cannon-bones. The writer measured these es in the fore limbs starting from the pisiform bone and reaching the moids and in the hind limbs from the point of the calcaneum to the se- oids. Both measures thus taken exceed the real lengths of the meta- pus and of the metatarsus by about one-third, as they include the carpus he fore limb and the tarsus with the calcaneum in the hind one. The umference of the cannon-bone was always taken on the right limb.

The writer gives the results of his measurements in 14 tables, of which last gives the averages of the 7 foals that were measured, both in absolute

figures and in figures relative to the wither height taken as 100. In th separate columns the percentages of growth of the various parts of the bo in the periods of 6 months, 1 ½ years and 2 ½ years are given.

Table I (next page) gives the summary of the data collected.

In two other tables are given respectively the absolute increase in cen metres and the increase per cent. of the various parts of the body. The me ures are arranged in the order of their respective intensity of increase.

The figures given in Table I confirm the well-known fact that ha have in comparison much longer legs and shorter bodies than adult hors while their chest and pelvis are also comparatively narrower.

It appears also that the lengthening of the body is specially connec with the growth of the barrel, that the length (upper and lower) of the ne increases relatively to the height of the withers, whilst (always proporti ately) the length of the cannon bones diminishes and the ratio betw the height of the withers, of the back and of the croup remains nearly co stant. Always relatively, the dimensions of the body (breadth, depth chest and width between hip-bones), the length of the shoulder-blade and t girth, and to a slight extent the circumference of the cannon bone, increa The circumference of the hock diminishes.

In a separate table the writer compares the results obtained by him half-blood foals from East Prussia with those obtained by Schöttler Hanoverian half-bloods. These appear more precocious than the form

The writer then examines the table in which the absolute growth centimetres, is given for the several parts of the body in progressive or

He notes that the smallest increases are in those meaurements t depend particularly upon the increase in length of the cannon-bo The other measurements follow in the order given in the table, with maximum for the girth measurement.

Examining the table which shows the data referring to the percen increase of the several parts of the body that were measured, in the or of intensity of growth, the writer remarks that it varies greatly, rang from a minimum of 3 per cent. (height at withers) to a maximum of 33 cent. (width at hip bones). The increase in length of the fore and hind non-bones was respectively 6.5 and 6.1 per cent., agreeing with Schött observations on Hanoverian foals, in which he also recognized the si development of the metacarpus and metatarsus. The other measurem follow in the order set forth in the table. Among others the high perc age of the increases in the length of the neck, of the breadth and dept the chest, and of the breadth between the hips are noteworthy.

In order to give a graphic demonstration of the foals that were m ured the writer has added to his work a plan showing the three out corresponding to the average of all the measurements, taken respecti at the ages of 6, 18 and 30 months.

TABLE I.

Measurements	I			II			III		
	Average of measurements of 6 and 7 foals respectively.						Increase compared with measurements of 1908		
	1908	1909	1910	1908	1909	1910	In 1909	In 1909-1910	In 1908-1910
	cm.	cm.	cm.	%	%	%	%	%	%
ngth of body from point of houlder to point of ischium	120.9	135.4	146.0	96.9	98.7	99.5	12.0	8.7	20.7
ngth of forequarters	29.6	32.0	34.2	23.8	23.1	23.3	8.1	7.4	15.5
» of barrel	53.0	60.6	66.8	42.5	44.2	45.7	14.3	11.7	26.0
» of hind quarters . . .	36.5	41.1	44.7	29.3	30	30.5	12.6	9.8	22.4
» of pelvis	—	44.5	46.4	—	32.5	31.6	—	—	—
om the pisiform bones to he sesamoids	29.3	30.4	31.2	23.5	22.2	21.3	3.8	2.7	6.5
om the calcaneum to the sesamoids	41.0	42.4	43.5	32.9	30.9	29.6	3.4	2.7	6.1
ngth of shoulder-blade . . .	37.9	42.4	46.7	30.4	30.9	31.8	11.9	11.3	23.2
» of neck (upper)	54.3	62.5	69.9	43.5	45.6	47.6	15.1	13.7	28.8
» » (lower)	36.6	43.5	45.8	29.4	31.7	31.2	18.8	6.3	25.1
» of head	—	—	—	—	—	—	—	—	—
eight of withers	124.7	137.1	146.8	100	100	100	10.0	7.8	17.8
» of back	120.5	133.2	141.5	96.6	97.2	96.4	10.5	6.9	17.4
» of croup	127.6	140.9	149.8	102.3	102.8	102.0	10.5	6.9	17.4
» of sternum (behind elbows)	73.6	77.1	81.8	58.9	56.3	55.8	4.8	6.4	11.2
ngth of ilium	120.3	131.5	139.5	96.5	95.9	95.0	9.3	6.6	15.9
» of ischium	113.7	119.1	124.9	91.4	86.8	85.1	4.8	5.1	9.9
» of knee-cap	85.1	90.4	95.5	68.2	65.9	65.1	6.2	6.0	12.2
» of hock	56.7	57.4	58.4	45.4	41.9	40.0	1.3	1.7	3.0
ght of the shoulder joint . .	93.6	97.5	102.0	75.0	71.2	69.5	4.2	4.7	8.9
» of elbow	78.4	81.8	85.6	62.9	59.7	58.2	4.3	4.9	9.2
of pisiform bone . . .	42.5	44.3	46.3	34.2	32.3	31.5	4.3	4.6	8.9
pth of chest	51.1	60.7	64.5	41.0	43.8	44.0	18.8	7.4	26.2
nt width of chest	29.1	33.1	35.5	23.4	24.2	24.2	13.8	8.2	22.0
lth of chest behind shoulders	27.0	32.4	34.7	21.6	23.3	23.7	20.0	8.5	28.5
adth within hip-bones . . .	35.7	42.6	47.6	28.6	31.1	32.3	19.3	14.0	33.3
th	133.7	150.4	169.1	107.2	109.7	115.2	cm. 16.7	cm. 18.7	cm. 35.4
cumference of fore cannon one	15.6	17.5	18.5	12.5	12.9	12.6	1.9	1.0	2.9
cumference of hind cannon one	17.1	19.6	20.6	13.7	14.3	14.1	2.5	1.0	3.5
cumference of hock	35.0	37.4	38.8	28.1	27.3	26.4	2.4	1.4	3.8

TABLE II.

Numerical order	Measurements	Average increase in relation to the measurements of 1908 was		
		in 1909	in 1909-1910	in 1908-
		cm.	cm.	cm.
1	Height of withers	0.7	1.0	1
2	Length of pelvis	—	1.9	—
3	From the pisiform bone to the sesamoids	1.1	0.8	1
4	From the calcaneum to the sesamoids	1.4	1.1	2
5	Circumference of fore cannon-bone	1.9	1.0	2
6	» » hind » »	2.5	1.0	3
7	Height of pisiform bone	1.8	2.0	3
8	Circumference of hock	2.4	1.4	3
9	Length of fore hand	2.4	2.2	4
10	Front breadth of chest	4.0	2.4	6
11	Height of elbow	3.4	3.8	7
12	Breadth of chest behind shouldsrs	5.4	2.3	7
13	Length of hind hand	4.6	3.6	8
14	Height of sternum	3.5	4.7	8
15	Height of shoulder joint	3.9	4.5	8
16	Breadt of shoulder-blade	4.5	4.3	8
17	Length of neck (lower)	6.9	2.3	9
18	Height of knee-cap	5.3	5.1	10
19	» of ischium	5.4	5.8	11
20	Breadth between hip bones	6.9	5.0	11
21	Depth of chest	9.6	3.8	13
22	Length of barrel	7.6	6.2	13
23	Length of neck (upper)	8.2	7.4	15
24	Height of ilium	11.2	8.0	19
25	» of back	12.7	8.3	21
26	» of withers	12.4	9.7	22
27	» of croup	13.3	8.9	22
28	From point of the shoulder to point of ischium	14.5	10.6	25
29	Girth	16.7	18.7	35

TABLE III.

Measurements	Average increase in relation to the measurements of 1908 was		
	in 1909	in 1909-1910	in 1908-1910
	%	%	%
Height of hock	1.2	1.8	3.0
From calcaneum to sesamoids	3.4	2.7	6.1
From pisiform bone to sesamoids	3.8	2.7	6.5
Height of shoulder joint	4.2	4.7	8.9
» of pisiform bone	4.3	4.6	8.9
» of elbow	4.3	4.9	9.2
» of ischium	4.8	5.1	9.9
» of sternum	4.8	6.4	11.2
» of knee-cap	6.2	6.0	12.2
Length of fore hand	8.1	7.4	15.5
Height of ilium	9.3	6.6	15.9
» of back	10.5	6.9	17.4
» of croup	10.5	6.9	17.4
» of withers	10.0	7.8	17.8
From point of shoulder to point of ischium	12.0	8.7	20.7
Front width of chest	13.8	8.2	22.0
Length of hind hand	12.6	9.8	22.4
» of shoulder-blade	11.9	11.3	23.2
» of neck (lower)	18.8	6.3	25.1
» of barrel	14.3	11.7	26.0
Depth of chest	18.8	7.4	26.2
Breadth of chest behind shoulders	20.0	8.5	28.5
Upper length of neck	15.1	13.7	28.8
Breadth between hips	19.3	14.0	33.3

1176 – **Cattle Breeding and its Importance in German East Africa. The Various Breeds of Cattle.** — LICHTENHELD, G. in *Der Tropenflanzer*, Year 17, No. pp. 405-430. Berlin, August 1913.

The 2 300 000 head of cattle in German East Africa are very unequa distributed. About one-third of the Protectorate is unsuitable for cat owing to tsetse, and much of the rest is not utilized.

All the cattle, with the exception of some animals imported from Euro are zebus. They mostly belong to *Bos zebu africanus*, but some *B. z. indicus* (called Sokotra cattle by the writer). Among the African zeb the writer draws a distinction between those with large horns and sm humps (Watussi, numbering 750 000) and those with small horns a large humps (Masi, 1 500 000).

I. *The Masai zebus.* — Bred chiefly by the Masai tribe. Colo usually red or yellow and brown, but frequently black or white and gr Pigmentation generally dark, rarely similar to the coat colour. Sk thick and coarse; hair smooth, short, with a silky lustre. Head sma often hornless, but frequently with short, stout horns bent slightly upwar Face slightly dished. Ears medium-sized, directed sideways and slight backwards. Neck of medium length, with the dewlap usually much dev oped. Withers wide; hump 12 inches high, and usually more develop in the male than in the female. Shoulders sloping and muscular. Ch relatively deep, occasionally somewhat flat. Body barrel shaped. Ba and loins of medium length and in a straight line. Croup weak and slopi Haunches very fleshy. Limbs short, but with small, regular bones. T legs are sometimes crooked, but to no great extent. Tail set on rat low, long and thin, with a large tuft. Hoofs small, hard, and varying colour from grey to black. Udder small, fleshy, almost hairless, with sho fleshy teats. The size of the animals varies in different localities and tains an average of 4 ft. 3 in. to 4 ft. 7 in., sometimes 5 ft. or 5ft. 6 in., height. The best developed animals are usually found in the hot dry distri while the less developed occupy the lower ground.

The Masai zebu matures late; cows do not come into heat until the a of 2 ½ years. The bulls and cows are full grown between 3 ½ and 4 years, but steers may go on developing until they are 6 years old.

The Masai zebu is a thrifty animal, and very resistant to weather a disease. The calves are subject to Texas fever, which is prevalent throug out the Protectorate and causes 1 per cent. loss, if the animals contra it during the first months of their life. If the disease appears later, t losses can amount to 20 per cent or over. The same occurs in the case anaplasmosis. Coast fever, in the districts where it is endemic, is respo sible on an average for the death of 30 per cent. of the calves; the remaind enjoy life-long immunity; but if this disease is introduced into a hither healthy herd, it may carry off 90 per cent. The number of cattle attack by tuberculosis is estimated by the writer at under 1 per thousand.

The Masai cows calve regularly every year. Calving is usually norm no assistance being needed, and it is followed by no bad after-effects. T

production is normally below 70 gallons per lactation period, but favourable conditions may be more.

The beef production of a two-year-old steer is easily over 220 lbs.; of 5 years of age give up to 440 lbs. of beef, and those of 7 years up to 8. The weight of the hump can attain 24 lbs. The meat contains fibres and is less marbled than that of European breeds. The fat mulates chiefly below the skin and round the viscera. These zebus tisfactory draught animals.

I. *The Watussi zebus.* — These are only bred by the Watussi tribe, are a little smaller than the previously mentioned animals. Coat ly red, brown or yellow. Head and horns longer then in the Masai Chest deep, but flat. Line of back and croup straight. Legs often ed. Milk production twice as large as in the case of the Masai type, meat production poorer. The animals are less resistant to epidemics ther forms of disease than the Masai zebus ; they cannot stand short s or want of water as well as the latter. These faults recur in crosses en the two types. The Watussi are also less fertile and develop than the Masai zebus.

II. *The Sokotra zebus.* — These were introduced direct from India erchants and are much appreciated for their good milking qualities. are especially suited to the coast zone, and will, in the opinion of the r, be still more popular in the future.

IV. *Cattle keeping and breeding by the natives.* — Most of the tribes their cattle in the open, but some give them shelter at night. The s are only put with their mothers for suckling. As the natives milk e cows the calves generally suffer from under-feeding. The large and mall domestic animals do not graze together. During the rainy season, r a short time after, the animals are at grass for some hours ; during y season, they remain in the field all day. When the natural supplies ter are exhausted, the natives dig wells to obtain drinkable water. n some districts where water is scarce, the animals are fed during ry season on succulent banana stems. One stem daily is considered ient for an animal in the cow-house. The natives have no idea of ng hay, or of storing fodder for times of dearth. When the grass of ture becomes scanty, the native sets forth in search of fresh fields, ds some of his cattle into good grazing districts, paying in return e pasturage the milk produced by the cows during their stay.

As a rule, the bulls used for breeding purposes are selected. They are ally chosen for shape, colour and maternal descent, the offspring of milkers being given the preference. Unsuitable animals are castrated. proportion of bulls ready for service is about 1 to every 20 cows. The are chosen for their good milking properties. A well-proportioned cow may be worth as much as three bullocks. As the natives use all cows for breeding the herds become very heterogeneous. According e writer, there is no selection of cows for breeding, for the idea is to use e available animals, and thus increase the size of the herds as much sible. In order to avoid in-breeding, the native exchanges his breed-

ing animals with those of other cattle owners. The Masai zebus are o
crossed with the Watussi, but the offspring produced by crossing these
types with the Sokotra zebu enjoy equal favour. Most of the native t
still refuse to introduce into their herds European cattle or their hyb

V. *Cattle keeping and breeding by Europeans.* — The methods ado
by the Europeans differ little from those which obtain amongst the nati
The chief aim of the European breeders is to have as large herds as possi
As a rule, their herds are less valuable than those of the natives, which a
more to be regretted as they import many bulls from Europe. The w
thinks that it would be best for the European graziers to begin improv
the native breeds before trying to introduce European blood. It has
found that European cattle and their crosses have little power of resis
the climate and the diseases peculiar to the country. It is true that s
success has been attained recently in rendering European cattle immu
from the most serious diseases, such as anaplasmosis and Texas fever,
for various reasons, immunisation cannot be practised generally. Europ
cattle if introduced should, according to the writer, be kept in the cow-sh

Alongside of ordinary farms, where, as on those belonging to the nati
the chief attention is paid to meat production, there are also some d
farms in the Protectorate. The milch cows on these farms are Soko
or of European breeds ; they are always kept in the stall, and receiv
addition to grass and hay " mogo " (1) and oil cakes.

VI. *The value and importance of the cattle.* — The price of a steer yiel
440 lbs. of beef varies from 25*s* to 90*s* according to locality. Cows fetc
quarter or half as much again.

At Daressalam a gallon of milk costs 2*s* ; at other places its price is fr
2 ½*d* to 10*d*. One pound of fresh butter costs about 3*s* at Daressala
1*s* 6*d* at Moschi ; 11*d* at Iringa. One pound of "samli" (2) costs 3*d* at
chief places of export.

Until lately, the cattle of German East Africa have been chiefly
portant as providing food for the native breeder, whose prosperity depe
for the most part upon his herds. Recently, however, they have also be
to supply the plantation workers and the town populations. Last y
about 12 000 oxen were sent for slaughter to the districts of Tanga and
helmstal. On the other hand, the writer estimates the number of anim
which annually find their way to the market at over 40 000. Consider
the small amount of business, and the low price of meat, there is no quest
of the rational utilization of the cattle. In all breeding districts the o
production of beef-producing animals is noticed. The writer consi
that the best means of preventing a crisis in this direction would be the est
lishment of factories for canning meat and preparing meat extract.

The number of cattle exported from the Protectorate was 545 in 19
240 in 1911, and 179 during the first half of 1912. As regards "samli

(1) This is a tuber of which the feeding value is about equal to that of the po
(2) Native-made melted butter.

300 lbs. were exported in 1910, 659 500 lbs. in 1911, and 399 600 lbs. ing the first half of 1912.

The duty on exported cattle amounted to about £17 000 in 1910 1911, and £10 350 during the first half of 1912. The small numbers orted are partly due to the prohibition of the importation of cattle into neighbouring colonies (except Zanzibar and the Congo) and the law idding cows being exported from the Protectorate. As draught ani- ls and producers of manure, the cattle in question are of no interest.

VII. *Methods of improving cattle-breeding.* — The writer is of opinion t it would be worth while to improve the breeds of cattle in German st Africa. In order to do this it would be necessary to improve the ma- gement of the animals, abandon the practices which lead to the under- ding of the calves, not allow the heifers to be served by the bull at such early age, and diminish the size of the herds kept in districts poor in for- . Hay should also be grown on the farms kept by Europeans, and maize, atoes, lucerne, etc., cultivated on dairy farms. A better selection of stud mals is very desirable ; in-breeding should be avoided, and only immune ls used in districts where coast fever is prevalent.

The writer advises crossing native and European cattle only for the rpose of improving the milk production, and considers that such crossing uld be practised by the European farmers exclusively.

The article is illustrated with pictures of the animals.

17 - **Welsh Black Cattle.** — SABORKSY, PAUL in *Mitteilungen der Landwirtschaftliche Lehrkanzeln der k. k. Hochschule für Bodenkultur in Wien*, Vol. 1, Part 4, pp. 511-585. Vienna, May 8, 1913.

In a section of his comprehensive work, the writer gives an account he range of the Welsh Black Cattle and of cattle breeding and agricul- e generally in Wales. He then passes on to describe the nature of the n and coat of the above-mentioned cattle. In section III are given the ernal measurements of 90 of these animals.

The writer has taken skull measurements according to the Adamerz thod. The measurements of 15 typical skulls, of which two are of the uth Wales type, are given in section IV. Attention is here drawn to differences between the two types, which consist chiefly in the form l course of the supra-orbital canals and the lachrymal bone, as well as he size of the angle of the interparietal bone, the length of the temporal sa and of the occiput. The mandible, the palatine, the nasal, and er bones in both types show indication of descent from a *brachyceros* e, while the maxilla recalls that of *Bos primigenius*. The skulls m North Wales show more signs of *primigenius* descent than do those m the South part of the Principality. The writer concludes from the asurements that both types are nearly related, but owing to the great erences in the skulls, he thinks they should be regarded from the agri- tural standpoint as independent race types. A mixed origin is unlikely. s certain that the Welsh black cattle, like other old British breeds, are pended from a specific wild type, perhaps a variety or a subspecies of

Bos primigenius, and thus occupy a special position in the stock-breedin system. From the combination of *primigenius* and *brachyceros* characte in the skull, the writer classifies this breed as *pseudoprimigenius*.

1178 – **Carcase Test of the Piedmontese Breed of Cattle** — MASCHERONI, E. *Cronaca Agricola*, Year XVIII, No. 12. Turin, July 1, 1913.

Though the Piedmontese cattle are considered a general purpose bree (meat, milk and work), nevertheless as producers of meat they are doubtle among the best Italian breeds, if not perhaps the best of all. Formerl this breed contributed largely to the exportation of cattle to France and t Switzerland.

The Piedmontese cattle mature early; frequently it is found that a the age of 18 or 20 months animals of this breed weigh 1320 lbs. and upward and at the age of four years considerably above 2 200 lbs. The meat is excellent quality. The animals are easily fattened without much expen and the percentage of dead weight is high.

Doctor Poli, chief of the Municipal Veterinary Office of Turin, was e trusted by the Ministry of Agriculture, in 1887, with the task of determinin the net carcase weights of Piedmontese cattle; from observations mad by him it appears that of 31 head of cattle taken at random, 14 gave dea weight percentages ranging between 49 and 55, and 17 above 55; of th latter 9 were above 60 and one reached 66.

1179 – **The Correlation between the Percentage of Milk Fat and the Quan of Milk Produced by Ayrshire Cows.** — *Journal of the Board of Agricul* Vol. XX, No. 5, pp. 447-448. London, August 1913.

An investigation was undertaken by the Board of Agriculture owing a desire for figures showing as definitely as possible the extent of the c relation between the quantity and quality of milk yielded by a cow. T work of preparing a report on the subject was entrusted to Mr. H. D. Vig an Assistant to the Head of the Statistical Branch of the Board. It w thought desirable to include in the calculations such other variable facto as might affect the milk yield of the cow and the percentage of fat contain in the milk, and for this reason it was decided to deal also with the age the cow, the duration of lactation and the date of calving. The conclusio are derived from data contained in a Report of the Ayrshire Cattle M Records Committee.

The conclusions drawn are:

1) After allowance has been made for the varying age and durati of the lactation period of the Ayrshire cows under examination, the mi of cows which gave the larger average weekly yields of milk shows a defin and appreciable tendency to be poorer in milk fat than the milk of cow which gave lower average weekly yields.

2) The duration of lactation had no significant influence upon th average percentage of milk fat produced.

3) The percentage of milk fat showed a slight, but definite, tendenc to be lower in the older than in the younger cows, after due allowance ha been made for the average weekly yield of milk.

4) Taking the herd as a whole, the duration of the lactation bore no ion to the average weekly yield of milk produced by cows. There is no evidence in the case of these cows, of a selective action in favour of ining in milk those cows that gave a better average yield of milk than rs.

5) In the herd under examination, the older cows show a definite appreciable tendency to give larger yields of milk than the younger s. This may possibly be due partly to a selective action in weeding cows which proved unpromising as regards their milk yield when young, partly to a physiological tendency for older cows to give better yields n younger ones.

6) The duration of lactation has possibly tended to be longer in older n in younger cows, although the evidence on this point is not quite inite.

If it is supposed that the average age and duration of lactation remain ltered, it appears possible to select a herd with an average yield of nearly gallons per cow per lactation (as compared with the 1909 average yield 537 gallons), without reducing the average percentage of milk fat pro-ed in the herd as a whole below 3.58 per cent., as compared with the sent average of 3.68 per cent. It must be borne in mind, however, it while this result may be regarded as the most probable, in the long the certainty of attaining it diminishes when only a small number of ws is being dealt with, and increases proportionately with the number of ws in the herd in which the policy of selecting cows with higher milk lds is pursued.

– **Investigations into the Daily Variations in the Specific Gravity and Fat ontent of the Milk of a Large Herd** (1). KLOSE in *Bericht über die Tätigkeit des tlichwirtschaftlichen Instituts zu Proskau für das Jahr* 1912-13, pp. 11-12. Oppeln, 1913. *ldwirtschaftliches Zentralblatt*, Year 42, Part 13, pp. 385-392. Hanover July 1, 1913.

In March, May, July and October, 1912, the writer investigated the ific gravity and fat content of the milk of 70 cows belonging to the herd he Proskau Dairy Institute. Tests were made thrice daily. These ths were selected, as it was important that the period of investigation ld include months during which the food was qualitatively the same, others when the rations varied. The cows' rations in March consisted of , straw, brewer's grains, and sunflower and sesame cakes.

In May, the animals received nearly the same food as in March for three s, and then were put out to grass until the end of July. From the 6th October, the cows grazed half the day, and unt'l October 17, when they rned to the shed, they were given grains, linseed cake, mangolds, straw hay. From the 17th to the 25th of October the linseed cake was re-ced by sunflower cake, and from the 25th to the 31st crushed barley was stituted for concentrated food.

(1) See No. 298, *B.* March 1913.

The daily variations in the milk content of each milking (morning, noon and evening), and the variation in the content of each day's milk (the aritmetical mean of the milk of the morning, noon and evening milkings) are given in tables. If the results of the different months are compared it is seen that the greatest variations in the content occurred in the two months March and July, when there was no change in the rations. While in March 18.9 per cent. of the single milkings and 3.3 per cent. of the daily milkings showed a variation in fat content of from 0.2 to 0.45 per cent., in Jult 34.4 per cent. of the former and 23.3 per cent. of the latter showed variations of the same amounts. The greatest variations in fat content were in July, when they reached 0.7 and 0.35 per cent. for single milkings and the day's milk respectively; in March, the highest variations were 0.45 and 0.16 per cent, respectively. In May, the highest variation in the fat content of the single milkings was 0.7 per cent, and that in the days' milk 0.25 per cent. In October, the highest variation in the single milkings was found to be 0.5 per cent, and that in the day's milk 0.26 per cent.

The number of variations in the single milkings were: 17 in March, 27 in May, and 31 in July and October respectively. The greatest variations in fat content in the day's milk occurred in July (during the full grazing season). Next come October and May (when the rations were varied). The day's milk showed least variation in fat content in March (when the rations were always similar).

In glancing over the variations in specific gravity, the similarity of the returns for March and October (when the cows were mostly stall-fed) and those for May and July (when the cows were mostly at grass) is very striking. In March and October, 10 per cent. of all the single milkings varied in specific gravity more than 1 lactodensimeter degree in 24 hours (highest variation 1.9 degree). In May and July, the number of single milkings which attained this amount of variation (highest variation 3.7 degrees) reached 33.3 and 31.1 per cent respectively. In spite of these numerous and large variations in the single milkings, the fat content of the daily milk showed a considerable adjustment of the differences.

The greatest daily variation of specific gravity was in July (0.0037), the smallest in October (0.0015). In March and May the variations did not exceed 0.002. The highest variations which occurred on change of rations were on an average:

Periods	Variations in fat content	Variations in specific gravity (lacto densimeter degrees
—	—	—
May 4-7	0.45	1.2
Oct. 6-8	0.30	0.8
Oct. 17-19	0.25	1.0
Oct. 25-27	0.50	1.1

It is thus evident that the variations in fat content and specific gravity were not much greater when the rations were changed. The writer concludes that the current idea that the variations in fat content of the milk of a lar

d on approximately similar rations are small, is a fallacy, and that ing for adulteration, as much stress must be laid upon alterations in cific gravity of the milk as upon the variation in the fat content. ie writer does not consider that fat content variations of 0.2 per nd even up to 0.3 or 0.4 per cent, are alone sufficient to prove adul- n, but they must be accompanied by a difference of 0.002 or more in gravity. In passing judgment upon milk from the examination mple taken in the shed, the alteration in the specific gravity is the oint to be noticed. Repeated fat determinations constitute the ethod of judging milk from the butter-making point of view.

The Possibility of Increasing, with Economic Advantage, the Average Content of Cow's Milk. — HANSSON, NILS in *Kungl. Landtbruks- Akademiens ndlingar och Tidskrift*, Year 52, No. 5, p. 289. Stockholm, 1913.

mong the components of milk, fat is the most valuable, both when milk as such and when it is used for butter or cheese making ; thus the eco-

Schematic diagram showing the composition of the dry matter of milk for different fat contents (as abscissae).

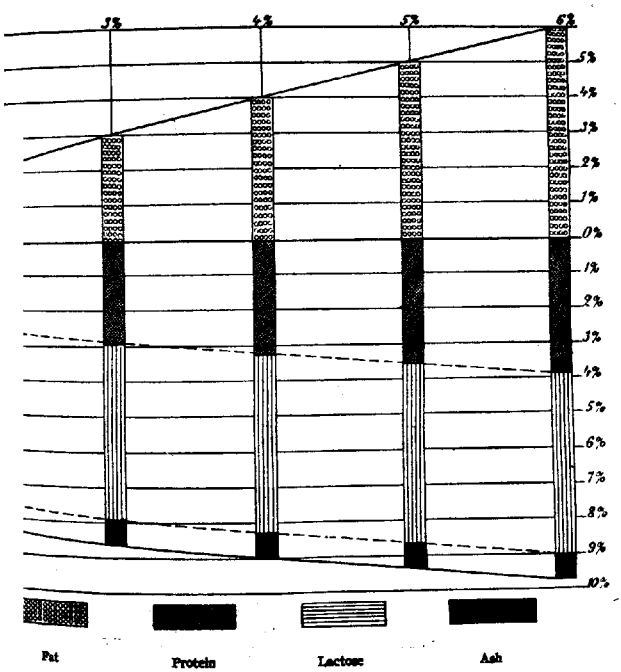


TABLE I. — *Average composition of the dry matter in milk.*

Fat in milk	Solids not fat in milk	Total solids in milk	Fat in the total solids	Solids not fat for 1 lb. of fat
%	%	%	%	lbs.
2.00	8.31	10.31	19.4	415
2.25	8.46	10.71	21.0	376
2.50	8.51	11.01	22.7	341
2.75	8.57	11.32	24.3	312
3.00	8.72	11.72	25.6	291
3.25	8.83	12.08	26.9	272
3.50	8.96	12.46	28.1	256
3.75	9.05	12.80	29.3	241
4.00	9.16	13.16	30.4	229
4.25	9.29	13.54	31.4	218
4.50	9.30	13.80	32.6	207
4.75	9.30	14.05	33.8	196
5.00	9.33	14.33	34.9	187
5.25	9.37	14.62	35.9	179
5.50	9.36	14.86	37.0	170
5.75	9.34	15.09	38.1	162
6.00	9.31	15.31	39.2	155

nomic importance of producing cheaply a milk rich in fat will be perce at once.

Without waiting for the theoretical solution of the problem, for last quarter of a century attempts have been made in Sweden to re it in practice. The writer, who is chief of the Animal Husbandry tion of the Central Agricultural Experiment Station of Sweden, disc in this paper the circumstances which exert an influence on the re and gives a résumé of what has been obtained up to the present.

In comparing the numerous analyses of milk that have been ma the course of feeding experiments carried out during 13 years at Bonn those that were made at Tranekjaer and Bregentved in Denmark, the w found that the composition of the dry matter in milk varies very regu with its fat content, independently of the breed of cow, of the time ela

LE II. — *Food required to produce milk richer or poorer in fat, calculated according to the composition of the milk. Average yearly production* 3 300 *kg.* (6600 *lbs.*) *of milk per cow. Live weight* 450 *kg.* (990 *lbs.*).

at tent of ilk %	Food requirement of cow per year — Food units	Food requirements for the production of				
		1 kg. of fat — Food units	100 kg. of milk — Food units	1 kg. of dry matter of the milk		
				Ration of production — Food units	Ration of upkeep — Food units	Total — Food units
50	1 909.0	25.5	63.6	2.46	3.32	5.78
75	1 955.9	23.7	65.2	—	—	—
00	2 002.0	22.2	66.7	2.58	3.11	5.69
25	2 048.7	21.0	68.3	—	—	—
50	2 095.0	20.0	69.8	2.68	2.93	5.61
75	2 145.5	19.0	71.4	—	—	—
00	2 188.0	18.2	72.9	2.77	2.77	5.54
25	2 234.5	17.5	74.5	—	—	—
50	2 281.7	16.9	76.1	2.86	2.65	5.51
75	2 329.1	16.3	77.6	—	—	—
00	2 376.4	15.8	79.2	2.98	2.55	5.53
25	2 423.3	15.4	80.8	—	—	—
0	2 471.0	15.9	82.4	3.09	2.46	5.55

calving, and of the feeding. This is shown by the accompanying dia- and by the figures of Table I, which give the composition of the total in milk, and according to which the solids not fat increase with the ntent, but to a lesser extent.

This increase concerns almost exclusively the protein content, which is t one-quarter of the total solids; it does not affect either the lactose ıe ash, the quantities of which, according to the analyses used, are st always constant relatively to the quantity of milk, namely about cent. of lactose, and 0.7 per cent. of ash.

This signifies that the richer a milk is, the less does the production of not fat influence the production of fat.

Taking these ratios of the components of milk as a basis, the influence e fat content of the milk on the food requirements of the cow has been lated.

TABLE III. — *Consumption of food for the production of* 1 *kg. of fat*

Average fat content of milk of the herds %	Food units per 1 kg. of fat	
	Southern provinces: Malmöhus	Central provinces
2.80 — 2.89	(25.6)	—
2.90 — 2.99	23.4	—
3.00 — 3.09	22.4	—
3.10 — 3.19	21.5	21.5
3.20 — 3.29	21.1	20.8
3.30 — 3.39	20.5	20.1
3.40 — 3.49	20.4	19.7
3.50 — 3.59	19.8	19.3
3.60 — 3.69	19.9	18.7
3.70 — 3.79	18.0	18.5
3.80 — 3.89	17.8	18.4

According to the standard of feeding of cows established by the writ on the basis of the results obtained by the milk control societies, co require one food unit for the production of 6.6 lbs. of milk. Supposing th standard refers to the production of a milk containing 3.5 per cent. of f the food required for the production of milk having another fat content h been calculated by valuing the proteins and lactose as fat according their calorific value and supposing, with Kellner, that 0.55 lb. of fat corr sponds to 2.2 lbs. of starch value (= 1.65 Swedish food units). The resu of this calculation (see Table II) is that for the production of 2.2 lbs. of f the food requirements of the cow diminish, but following a decreasi ratio, with the increase of the fat content of the milk. For the productio of 220 lbs. of milk, this requirement increases following a continuous rat of about 1.5 food units for 0.25 per cent. of the increase of fat content.

This increase of consumption of fodder does not seem to be connecte with the quantity of total solids. On the contrary this ratio is almo constant, for if the quantity of fodder required for the production of a ce tain quantity of solid be divided into its two parts (ration for upkeep an ration for production), it will be found that the increasing amount of fo der required for production, which depends upon the greater calorific valu of the fat compared with that of the other components of milk, is balance by the decreasing quantity required for upkeep distributed over the tot solids produced.

This theoretical deduction is further checked by an investigation on th results of the milk control societies. This investigation was made with th

f showing the difference in the consumption of fodder for the produc-
th of 1 kg. of fat and of 100 kg. of milk of varying richness. Table
ich gives the figures for the controlled herds of the most southern
e and those of the three central provinces in separate columns,
he consumption of fodder separately for each herd.
e results are grouped according to the average fat content of the milk.
ese figures for 2.75 to 3.75 per cent. of fat correspond as well with
Table II as among themselves, especially if it be considered that the
of Table II are calculated for cows weighing 450 kg. (990 lbs.) and
exactly 3000 kg. (6600 lbs.) of milk, whilst the figures of Table III
cows of varying weights and yields. In this table the figures for
ses of the poorest and of the richest milk are based on so small a num-
ows as to have very little value.
e practical results of the control societies thus show, by their agree-
ith the theoretical deductions, that fat may be produced with a much
consumption of fodder in rich milk than in the poorer milk.
at content is increased from 3 to 4 per cent., the consumption
per kg. of fat is reduced by 4 to 4.5 units, that is by about 1.8 per cent.
uantity of food necessary for the same production in milk containing
ent. of fat. The very small diminution of solids not fat relatively to
ntity of fat which thus results from the increase of the fat, has next
mportance economically owing to the low value of these components.
increase in the fat content of milk leads to considerable profit
es where milk is used for the manufacture of butter or where it is
according to its real value. But for the very frequent cases in which
e of milk is fixed independently of its fat content, it becomes impor-
know if the production of fat milk requires more fodder than that
milk. In order to resolve this question, the writer compared groups
yielding milk of different fat content; he has arrived at the results
e consumption of forage per kg. of milk grows proportionally to
t content. The calculation of this ratio has yielded somewhat
e results, but it may be admitted as an average that an in-
of 1 per cent. of fat corresponds to an increase of 6.3 food units
production of 100 kg. of milk, which agrees with the figures of
I. For a butter which is paid 2 kroner per kg. (1s a lb.) this increase
cent. of fat in 100 kg. of milk is worth nearly 2.2 kr. (2s 5d), but 6.3
its are worth less than 0.7 kr. (9¼d). It is thus proved that the greater
f the food required for the production of a richer milk does not
about 30 per cent. of that of the fat content of the milk. It is thus
geous to produce a rich milk if it is paid according to its real value.
se this is not the case when the increase in the fat content of the
obtained at the expense of the average quantity of milk, because it
ially upon this that the cost of the production of milk depends.
ter having thus treated of the advantage of an increase in the fat content
, the writer reviews the means to be adopted to obtain it and the
s which has been hitherto achieved in Sweden. It has been proved,
, that certain kinds of food, such as palm and coprah cakes and

the leaves of beets, have a tendency to increase the fat conte
the milk produced, whilst others, such as poppy and German sesame c
and inferior rice flour, act in the opposite way. Nevertheless it is
by feeding that sure progress is to be expected, but by selection in brec
with this object in view.

This truth has long been recognized in Sweden, but even now the
gress has been in general but slight, whilst in Denmark it is very mar
The writer nevertheless mentions some Swedish herds in which a dec
progress has been noted during recent years, as is proved by the cha
figures of the breeding centre competitions (1). One herd especially,
of Alberga, of Ayrshires, gives a good example and unassailable proo
the manner in which this progress has been realized.

The writer mentions the Kolle-Kolle herd in Denmark as a fa
example of the influence that a bull may have by the capacity of trans
ting to the female line a high productiveness of milk rich in fat. The
gives a list of the bulls most employed for the development of the
Friesian breed in Sweden, with notes on the production of milk and o
in the daughters of these bulls as compared with the production of their d
He demonstrates that most of these bulls have transmitted to their daug
a productiveness greater than that possessed by their dams. On the other
some of them have exercised a contrary influence upon the qualities
their descendants.

In order to demonstrate the practical possibility of increasing the
duction of butter fat by means of the selection of the breeding ani
the writer gives a summary of the development of the Alberga herd a
the choice of the bulls that were used. Thanks to the determinatio
the quantity of milk and of its fat content made regularly since 189
all the cows of the herd, it has been possible to calculate separately the
duction of milk and of fat for the groups of descendants of each bul
of each cow.

As for the bulls, five have had a remarkable influence on the dev
ment of the herd. If the cows are distributed in families according t
bulls that were their sires, or paternal grandsires, a great difference i
average quantities of milk and butter fat of the different families will be
But in order to establish with certainty the influence of each bull upo
offspring, it would be necessary to compare separately the production of
of his daughters with that of their mother, making such comparison a
same age, that is to say for the lactation periods following the first se
third, etc., calving. In this manner the influence of the normal increa
production during the first lactation periods would be eliminated.

This comparison has been possible for only two of the Alberga
For the other three bulls only the average figures for all the years of p
tion of their daughters and of the dams of these were available.

(1) For the definition of the breeding centre competitions in Sweden, see I
NANDER's original article: « The Development of Cattle Breeding in Sweden », pa
(E
of this *Bulletin*

TABLE IV.

Names of bulls	Number of daughters	Controlled during years	Sum of years of control	Average yields		
				Milk kg.	Fat %	Fat kg.
s	61	5.92	361.12	2 545.1	3.70	94.17
. . . . .	61	3.59	218.99	2 347.3	3.59	84.31
				+ 197.8	+ 0.11	+ 9.86
rs	69	3.78	260.82	2 863.6	3.78	108.31
. . . . .	69	3.61	249.09	2 535.1	3.61	91.64
				+ 328.5	+ 0.17	+ 16.67
r's *Joy*.						
rs	26	4.54	118.04	2 811.0	4.01	112.76
. . . . .	26	3.70	96.20	2 537.1	3.70	93.92
				+ 273.9	+ 0.31	+ 18.84
rs	11	—	37	3 470.1	3.90	135.35
. . . . .	11	—	37	2 780.5	3.72	103.47
				+ 689.6	+ 0.18	+ 31.88
V.						
rs	15	—	30	2 672.6	4.30	115.01
. . . . .	15	—	30	2 914.2	3.90	113.58
				— 241.6	+ 0.40	+ 1.43

ese results of the comparison are shown by the figures of Table IV ive the increase (+) or the decrease (—) of the production of the each family compared to those of their dams.

e five bulls have all of them caused an increase of the fat content milk, and four of them have also caused an increase in the quantity produced, but from this point of view the fifth has caused such ase that the progress in the production of fat has been almost nil. vertheless, in order to be just in the verdict on the value of a bull eding purposes, the productiveness of the cows with which he is mated be observed. The higher this was, the more difficult it became for

the bull to raise it still higher. The writer has illustrated this fact by g
ing the dams of each family of a bull according to the fat content of
milk. From this grouping it appears that the poorer the milk of the
the more could all the bulls cause the fat contents to rise. In the
in which the milk was richest two of the bulls have caused the fat cont
sink. A bull may thus act favourably on the average fat content o
herd and exert an unfavourable aotion in another herd in whic
faculty of yielding a rich milk is more developed.

Calculating the average fat content of the milk of all the descen
of a bull, the writer has determined the fat content that this bull repro
and which he can transmit as inheritance. He calls it " genotype fat co
percentage " of the bull.

The writer summarizes as follows the results of his investigations o
influence that the choice of the bulls has on the fat content of the

1. It is possible to increase the percentage of fat content of the
of a herd, with economic advantage, by a judicious selection of the b
ing animals.

2. By dividing a herd into families of descendants of the sires a
the dams, the influence of each animal on the development of the qu
of the herd may be better demonstrated.

3. The influence of the males is demonstrated by the average prod
of all their female descendants, or still better by a comparison of the
age production of their daughters with that of the dams of these dau
when they were of the same age.

4. The influence of the bulls on the percenrage of fat content of th
of their female descendants depends upon the qualities of the females
preceding generations.

5. The influence of the cows appears in the fact that a bull poss
a certain genotype percentage of fat cannot increase the percenta
fat in the milk except in the daughters of cows inferior to him in the pe
tage of fat content, whilst the daughters of the same bull out of cows
ing richer milk will have a percentage of fat inferior to that of their d

6. The males and the females transmit to their descendants the pe
tage of fat which they themselves have inherited from their ancestor
male and the female having, as it appears, an equal influence on com
that they represent the same constancy of results in this respect. But
to its larger number of descendants, the male has a greater influence o
development of the herd.

7. Nevertheless, as is usually the case in questions of heredity of
titative characrers, variations are frequent, so that some particula
mals may have an average fat content percentage very different from
of the sire or of the dam; but the average percentage of all the descen
is in general very near to the average genotype percentage of fat
sire and of the average fat content of the dam's milk.

8. For the improvement of animals, as well as for that of plants, it
be sought to unite the qualities having the greatest practical value;
effort towards the attainment of such a high yield of milk as wo

ous to the health of the animals must be carefully avoided, as well as figures in the butter fat content. But everywhere where milk is according to its quality, the object in view should be to combine the in these two directions in order to attain a high production of fat.

The principal means of increasing the fat content of the milk is a scru- selection of the breeding animals, especially of the bulls, judging the ype percentage of butter fat according to : *a*) the average percentage milk of their dams, grandams and sisters ; *b*) the influence of their sires randsires on their daughters; and, when the bulls are sufficienty old, ir own influence on the average per centage of butter fat in the milk ir female descendants.

The Improvement in Sheep-Breeding in Algeria. — COUSTON, F. in *La Revue Colons de l'Afrique du Nord*, Year 2, No. 31, pp, 488-490. Algiers, July 31, 1913.

The official statistics give a total of 9 million sheep for Algeria ; of one-fifth are found on the sea-coast and the Tell, and four-fifths in ahara and the semi-arid plateau steppes. Efforts for improvement therefore necessarily be devoted to varieties of sheep adapted to the entioned districts. Hitherto, the breed most used for improving itive sheep has been the Rambouillet, although Crau and Spanish Me- are also imported. So far, no satisfactory results have been obtained. os are not suited to the food and climatic conditions obtaining in ia. On the Government sheep-farms at Taadmit, Birin, Ben-Chicao loudjbeur, the Rambouillet Merinos die very soon after importation. lambs even do not live. The veterinaries and sheep-breeders are lore of opinion that the Rambouillet sheep is unsuitable to Algeria. vriter has also little hopes of the greater success of the more resistant such as the Spanish and Crau Merinos. They have shown them- to have little adaptability, and have only yielded moderately satis- ry results when mated with the native breeds.

According to the writer, the Algerian sheep-breeding industry can only iproved rapidly and economically by means of a rigorous selection of ative breeds. Three of the latter are especially adapted to this end: ibran, Hodna and Ouled-Djellal sheep ; they are all hornless, stand in. high, and when full-grown give as much as 66 lbs. of mutton. In to improve the breeds, the writer recommends the careful selection best rams, and their distribution by the State to the sheep-breeders.

Fourth Egg-laying Competition in Tasmania. — Profitable Egg-Production *he Agricultural Gazette of Tasmania*, Vol. XXI, No. 5, p. 184. Hobart, May 1913.

The fourth egg-laying competition, held at Springvale, has recently ed, and it is interesting to note some of the chief features in this con- on.

In 1909-10 a pen (6 fowls) of White Leghorns scored highest honours, a total of 1248 eggs. In 1910-11 Black Orpingtons came to the fore 1318 to their credit. In the two last competitions White Leghorns topped the list with 1250 eggs in 1911-12, and for the season just

finished 1272 eggs. The all-round average of the birds competing improves.

Last year it was pointed out that a perusal of the lists of eggs sho that, as compared with previous competitions, there was no "falling aw in the number of eggs laid in respect to pens at the bottom of the list. the first competition 28 pens competed, and five of these produced less 800 eggs each. The second event saw the number of pens increase t and six pens fell below 800 each. Last year the competition had 33 and only two of these fell below 800 eggs. This year the three lowest recorded 943, 956 and 983 eggs respectively. This means that the lo pen in the competition averaged over 157 eggs per bird.

Approaching the results arising from this year's work from an standpoint it will be seen that 19 pens out of the 29, or over 70 per c recorded more than 1200 eggs per pen, which means that each bird i pens averaged over 200 eggs. (1). No meat was employed in the di the birds competing, but skim-milk and lucerne were provided to fu protein. The following table shows the first three pen yields and lowest three for the four competitions at Springvale:

Highest.

1st	year	1248,	1179,	1155;	total:	3582
2nd	»	1318,	1298,	1215;	»	3831
3rd	»	1250,	1201,	1188;	»	3639
4th	»	1272,	1261,	1261;	»	3794

Lowest.

1st	year	670,	654,	410;	total:	1734
2nd	»	661,	614,	614;	»	1889
3rd	»	801,	794,	632;	»	2227
4th	»	983,	956,	943;	»	2882

It is at the tail end where any improvement will be noticeable, an find that the lowest pen yield in the 4th year more than doubled the nu of eggs laid in the corresponding pen entered the first season.

1184 – **Ostrich Farming in Australia.** — HERBERT, T. J. in *The Agricultural of New South Wales*, Vol. XXIV, No. 6, pp. 511-521. Sydney, June 2, 1913.

Several shipments of ostriches have from time to time been imp into Australia. In 1873 the Melbourne Acclimatization Society imp some; and later, in 1881, Mr. W. Malcolm set about establishing os farming in South Australia, and imported a number of birds. A farm started at Gawler, and a large number of young ostriches were succes hatched and reared.

About this time an Act was passed by the South Australian Govern with a view to encouraging the establishment of the industry, by offerin

(1) The grand total of eggs laid by the 29 pens competing was 34137, or an a of 1177 eggs per pen, and as there were six birds per pen the average of each bird as high as 196 eggs. No substition of birds was practised in this competition. (Ed.

mple of 5000 acres of land to the party who first placed 250 ostriches one year old upon the land. Mr. Malcolm's venture was formed into mpany (the South Australian Ostrich Company), which obtained 5000 near Port Augusta under these conditions.

The country in the neighbourhood of Port Augusta, with an annual ge rainfall of only 9 inches, must be classed as inferior pastoral land. he birds have thriven, and a flock of 700 is now pasturing on the without any artificial feeding except during the first few months of their when they are fed on lucerne and bran. One and a half acres of lu- are grown and watered from the town water supply. The farm atly handicapped by not being able to produce more green fodder; wise a greater number of chicks could be reared. The improve- nt in the plumage brought about by feeding lucerne was strikingly n when eight birds were sent to Melrose, about 40 miles distant, where were grazed in a lucerne paddock. The feathers were clipped and sold Melbourne manufacturer, realizing £7 per clip per head, or more than le the amount realized from the same birds when grazed on the scan- grassed paddocks at Port Augusta. Birds from the Port Augusta farm been the origin of almost all the ostriches now pasturing on the various throughout the Commonwealth.

In South Australia itself there exists another flock of 400 birds, running station near Lake Alexandrina, the nucleus of which came from Port sta.

In New South Wales there is a flock of 100 head at South Head, near ey, which thrives well, but whose further expansion is limited by lack ace. At Hawkesbury Agricultural College a second flock has been oped from a single pair acquired in 1900, and produces feathers of high quality.

Another flock was started at Nardoo, near Coonamble, in 1905, with of birds from the South Australian Ostrich Company; the birds now er 550 and it is proposed to increase them still further; 2500 acres are ed to their use, and the owner of the flock, who also has a 5000-acre run, intimates that he receives greater net profits from the ostriches from the sheep, though no birds have yet been sold. An artesian rovides abundance of water, and 30 to 40 acres are under lucerne, ng a cut about every six weeks in summer; this is grown more as a re of precaution against possible drought than from absolute neces- or, so far as present experience goes, hand feeding is rarely required. ay is stored and when fed is chaffed, damped, and mixed with bran or

It is estimated that the land will carry 1 bird (or 3 sheep) to every s, running on natural pasture alone. It will probably prove more ible to grow fodder, as this would not only increase the carrying ca- of the land, but also raise the quality of the feathers.

he writer has an ostrich farm on the Yanco Irrigation Area; its area acres, of which 108 are irrigable and destined to lucerne. The flock ilt up from birds from the South Australia Co., and at present num-

bers 90 birds; last year 12 Soudanese ostriches were imported from N Africa to be mated with the South Australian strain.

A flock of 24 adult birds, the progeny of the Hawkesbury College str has also been taken to Queensland, where attention is now being paid to subject of ostrich raising.

1185 - **Further Report on the Isle of Wight Bee Disease.** — *Supplement N to the Journal of the Board of Agriculture.* London, July 1913.

This supplement contains a detailed account of the progress of the vestigation into the cause of the Isle of Wight Bee Disease. The latte attended by certain symptoms, such as inability to fly, the presence of merous bees on the ground in front of the hives, and the dwindling of sto many other symptoms have however been recorded, and no one of thes characteristic of the disease. The only essential feature is the death large numbers of bees, and often of the whole stock, especially during wet and cold periods of the year, or during the winter months. The dis is probably endemic, but owing to lack of information, it probably of passes unnoticed in mild seasons, the loss of bees being attributed to c starvation, spring dwindling, etc.

During the years 1911 and 1912, *Nosema apis* in some stage has b found in almost every stock apparently suffering from the Isle of Wi disease which has been examined, and, moreover, no bacteria other th those found in normal bees have been detected. It can therefore be sta with confidence that *Nosema apis* is the agent responsible for most of outbreaks in which the symptoms of the Isle of Wight diesease have b noticed, or in which the stocks have dwindled or died without appar cause.

1186 - **Domesticated Reindeer in Newfoundland.** — *The Field*, Vol. CXXI, No. (Supplement). London, June 28, 1913.

Dr. Grenfell, the famous Labrador missionary, has been using rein teams for hauling his *kometiks* (sleds) in the various trips he has made f his headquarters at St. Anthony along the coast of northern Newfoundl during the past winter. He speaks most enthusiastically of the rein experiment, which has appealed so strongly to the Canadian author that the Dominion Department of the Interior purchased 40 of these mals last summer for its own use. They were transported from N foundland to Edmonton and thence to the Mackenzie delta to be used the mounted police for drawing teams in winter, so as to prevent a repeti of the tragedy which attended the effort of Inspector Fitzgerald's pa to cross the frozen wastes during the winter of 1910-1911.

In the northern part of Newfoundland there are very few horses dogs for haulage purposes. The same is true of Labrador, where the c ditions are even worse, as the Labrador dogs are vicious brutes which att and devour even human beings. Dr. Grenfell took up the reindeer exp ment with the idea of inducing the people to substitute reindeer for dog soon as he could supply them with sufficient of the former. Reindeer also useful in providing milk, which is much needed for the children;

opagate very rapidly, it is believed that it will be possible in a few
) kill them for food purposes, and thus help to supply the domestic

e original herd, consisting of 300 Lapland reindeer, was imported by
nfell about five years ago, with a fund of $ 15 000 raised partly in
a, and partly in England, with $ 5 000 contributed by the Canadian
ment. This herd has increased naturally and now numbers over 1 200
One reindeer will do more work than six of the dogs formerly used.
Grenfell adopted the idea of introducing reindeer into Labrador
e late Dr. Sheldon Jackson, who introduced them into Alaska twenty
go. The latter, in spite of many difficulties, succeeded in obtaining
in number of these animals, which by successive additions and na-
ncrease now amount in number to 15 000. The world received an
lesson in 1896 when a number of whaling ships were frozen fast
the Arctic circle and a herd of 500 reindeer were driven 700 miles
ply them with food.

ndeer can be used as saddle and as pack animals ; they can take 150
s. on their backs. Harnessed to a sled, two of them will pull 500
s. thirty miles daily. Kellman drove his reindeer express on one
95 miles in one day. At present the most northerly mail route
orld, that between Kotzebue and Barrow, Alaska, a distance of 650
served by reindeer. No food need be carried for them, as at the
ach day's journey they are unharnessed and at once dig through
w with their powerful hoofs to the white moss below, which serves
s food.

ien Dr. Grenfell began his experiments in Newfoundland, he was
te enough to secure the services of Capt. W. C. Lindsay, a retired
Army officer. The latter took over the control of the herd of rein-
nd under his skilful and capable management even better results
een achieved than by the American Government in Alaska. The
age of living fawns from the Alaskan deer, as given in the Govern-
ecords, is 40 per cent., whereas at St. Anthony it is nearly 100 per
The only trouble that is found at St. Anthony is that the dogs some-
ttack the deer, and the latter in running away over the rough ground
ak their legs and have to be killed.

ndeavour was made in the summer of last year to secure a number
wild caribou to cross with the reindeer, but owing to the plague
which was unusually bad, the idea had to be given up. It is hoped
te will be greater success this year.

reindeer wandered considerably more last winter than the prece-
; this was due, in the opinion of the Laplanders, to the fact that
nals have learnt that there are no wolves in the country to fear.

er another season, it is proposed to break up the present large herd,
ribute it among the Mission Stations in Labrador, where, after the
of reproduction has continued for some time longer, the Alaskan
of lending small herds to the natives to enable them to replace the
ll probably be adopted.

FARM ENGINEERING.

1187 – **Motor Plough Competition at Königsberg.** — MARTINY in *Maschinen Rundschau*, No. 2, pp. 6-9. Königsberg, July 1913.

The Chamber of Agriculture for the province of East Prus Königsberg organized a motor plough trial in a field at Löwenhage Königsberg on June 4, 1913.

The following motor-ploughs were presented :

The " Ihace " : 45 to 60 H. P.; it weighs, with ploughing tackle, 1 16 cwt., and costs £ 1127.

The " Podeus " : 65 H. P., weighs, with five-share balance plough, 7 cwt., and costs £ 1078.

The " Pöhl " 70 H. P.; it weighs, with plough, 5 tons, costs £ 833.

The " Arator " : 50 H. P.; weighs, with plough, about 5 tons, and £ 882.

The " Ergomobil " : 30 to 35 H. P. ; weighs, with plough, 9 tons; and costs £ 1054.

The " Stock " : this costs without reversing gear £ 833 ; with it

The " Wede " : 56 H. P.; weighs 5 tons and costs £ 933.

The " Komnick " : costs about £ 980, and weighs about 4 tons

Both the soil and the weather were favourable to the trials, the shallow ploughing a two-year-old pastured clover ley on mild loam chosen. For the deeper work, a field dry on the surface and suffici moist underneath was used.

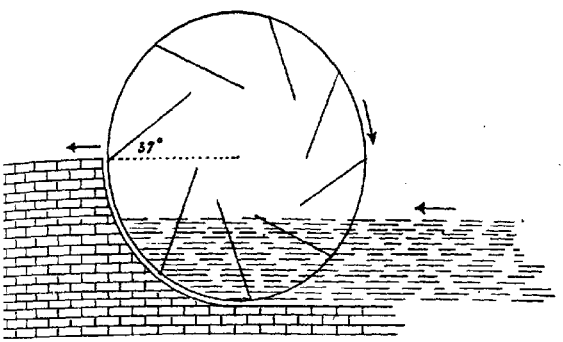
The motor ploughs, thanks to the very favourable soil conditions, w well. As for the amount of work done, only a few trial tests were mad some of the machines. The results are given in the following table:

Motor plough	Quality of soil	Depth of work	Breadth of work		Speed per second	Ar plo per
		inches	ft.	in.	feet	
Ihace	Medium soil	9 1/2	7	9	2.85	
Arator	»	—	6	7	3.94	
Stock	»	8	6	7	4.26	
Wede	»	8	5	»	3.11	
»	»	9 1/2	5	»	2.98	
»	Heavy clay soil in good conditon of moisture.	9 3/4	5	»	3.60	

Lastly the writer discusses the quality of the work performed by motor plough.

An Egyptian Water-lift. — PARR, A. E. in *The Agricultural Journal of India*, VIII, Part III, pp. 293-294. Calcutta, July 1913.

A very useful water-lift for low-lift canal irrigation has recently been received from Egypt. It consists of two circular pieces of iron on axle about 15 inches apart. These two wheels are connected together



by a number of vanes set on at an angle of about 37° to the radius, as in the accompanying drawing. The whole thing revolves in a close-fitting masonry basin. It is geared to run at a slow speed and may be worked by one animal. The wheel discharges the water at the height of its own axis." The reporter recommends it as the best machine he has tried for low lift irri-

Automatic Drinking Trough (1) for Pigs. — THALLMAYER, V. in *Wiener Landwirtschaftliche Zeitung*, Year 63, No 56, p. 647. Vienna, July 12, 1913.

Automatic drinking troughs for pigs are frequently used, especially in Austria. A simple form of such a trough is the one shown in the accompanying figure. The trough (T) is provided with a cover (D) under which a float is situated. The lever (H) connects the float with the valve (V). When the trough is used the float sinks and by means of the lever pushes the valve so that the water from the tank or water-pipe (B) can flow into the trough, through the pipe (R); (mn) is a flange.

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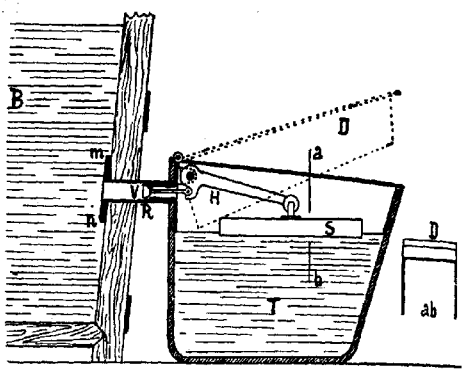
(1) No. 575, *B.* May 1913.

To the right is a section through the cover along the line (ab). cover (D) is necessary to prevent the animals touching, the float attached parts with their snouts.



Automatic drinking trough for pigs. Vertical section.

1190 – **A New Apparatus and Method for Milk Sterilization.** – Loesch, *Molkerei-Zeitung*, Year 27, No. 57, pp. 1105-1106. Hildesheim, July 25, 1913.

As an appendix to an article which has been already mentione the writer gives a detailed description and diagrams of a complete pla carrying out the new " Biorisator-Process ".

The principal part of the " Biorisator " apparatus is the so-c " Biorisator " sterilizer. This consists in the main of two cylindric ceptacles placed one within the other. In the inner the milk is red to a fine spray. In the space between the two cylinders, the milk is he Steam is conducted along a pipe at the side, in order to obtain the nece heat for the inner cavity, and for the sterilization process. As secon apparatus may be mentioned a forcing pump, a compressor and a co

The method of working is as follows (see Plate) : The milk in the lector (*a*) is drawn through the pipe (*i*) by means of the forcing pum and conveyed by (*k*) to the compressor (*c*). The manometer (*m*) reg the amount of pressure, and the regulator (*d*) carries back by the pi any superfluous milk. The milk is conveyed by the pipe (*o*) from compressor to the biorisator and issues through fine orifices into the int of the latter. After having been reduced to spray, the milk flows from biorisator (*e*) through the pipes (*r*) to the cooler (*f*) and is here cooled as

pipe (*w*) and flows to the tank (*g*). From here it runs to the bottle-g machine (*h*), where it is immediately put into bottles.

Before the milk is sterilized, the whole plant is cleaned, either by pump-water through it, or preferably by allowing the water to flow through supply pipe (*q*) into the biorisator, after closing the milk valve (II) and ning the water valve (III). The necessary heat is obtained by opening steam valve (I) at the same time. The very hot water flows through the le plant and sterilizes it. After about 10 minutes, the cooler (*f*) is at-ed and the water-valve (III) is opened; all the water is drawn off, the perature is raised to about 75° C. (167° F.) (the heat required for steri-g the milk), the pump is set going and the milk valve (II) is opened. apparatus can now work for hours without stopping and only needs asional attention.

The product obtained by the Biorisator Process is a pure milk, free n bacteria, with the characteristics of raw milk; it is especially suitable infants. It is also possible to obtain excellent dairy products from milk, which can be treated just like raw milk.

It was also observed in the dairy that there was no evaporation from nilk, and consequently no decrease in its amount.

RURAL ECONOMICS.

- **Systems of Land Tenure Prevalent in the Plain Belt of the Province of Treviso, Italy.** — SACCHI, G. in *L'Agricoltura italiana*, Year 39, Part 749. Pisa, August 31, 1912.

This is a short study of the commonest forms of land tenure in the plain of the Province of Treviso, Italy, which shows how in the same regions e are farms worked by the owners, farms leased and farms held on the e system (metairie). The least frequent form is farming by the owner self, because, though the estates are prevailingly large or medium sized, onomic unit is the individual farm, varying in extent from 5 to 15 acres. nds that are managed directly by their owners or their agents are thus the large estates, and chiefly portions of these that are not divided arms, or the small holdings of peasant proprietors. The latter are not rous, but they tend to increase.

The rent is paid partly in cash and partly in kind: that of the arable n of the farm is given in cash or in kind corresponding to a sum, while the rent of the vineyards and mulberry plantations is by half of the produce in kind. Frequently a certain number of labour or royalties in kind are included in the rent. This form sing prevails on the right of the Piave. The lease is tacitly renewed r year until either of the parties gives notice to the other between h and the 11th of November. Only the farms belonging to charitable lations are leased, mostly for periods of nine years, for cash only. ine, or the half-share system, though not always so simple as in

Tuscany, prevails on the left of the Piave, where the natural fertility the soil and the just proportion between the available hands and the ext of the farms have been powerful coefficients in the success of this system tenure, which has led to an advantageous ratio of arable land to plantati of vines, mulberries, etc.

The owner of the land supplies the necessary capital in live sto he pays one half of the various expenses of production (save labo the whole of the taxes, and all the cost of new plantations of tr and vines. The expenses caused by the control of fungus pests, well as the cost of props and wire for the vines, are defrayed in eq shares by the owner and the farmer. The latter, on his side, genera brings into the farm the commonest machines and implements, he provi all the labour and pays house rent, besides giving the owner some royal in kind and occasionally some days' work and doing some carting for h especially when the latter manages by himself some small portion of estate.

The rotation and manuring to be used are determined by the ow The contract is indefinite and it may come to an end any November provi the necessary notice has been given in the previous March.

1192 – **Persons engaged in Agriculture in Prussia according to the Census June 12, 1907.** — HAGMANN in *Mitteilungen der Deutschen Landwirtschaftsgesellsch* Year XXVIII, Part 34, pp. 483-486. Berlin, August 25, 1913.

For the first time, in 1907, the numbers of persons engaged in agric ture have been registered in the returns of professions and exploitati The comprehensive results of this census are given in Vol. 212, 2*b* of the Sta tics of the German Empire, which has recently appeared. Table I gives numbers of persons engaged in agriculture divided into five classes acc rd to the sizes of the farms.

TABLE I. — *Persons engaged in agriculture.*

Classes according to size	Men	Women	Total	On 100 ac productive area
Under 5 acres.	747 559	1 846 911	2 594 470	105.0
Between 5 and 12 ½ acres	673 416	824 383	1 497 799	35.5
» 12 ½ » 50 »	1 273 995	1 244 343	2 518 338	17.5
» 50 » 250 »	754 476	620 171	1 374 647	8.5
Over 250	602 992	432 278	1 035 270	7.0
For the total area	4 052 438	4 968 086	9 020 524	17.4

Classes of farms according to size	Managers of farms	Members of family engaged		Salaried persons			Temporarily engaged
		Permanently	Temporarily	Foremen and accountants	Permanently engaged		
					servants	day hands	
	1	2	3	4	5	6	7
a) *Absolute figures:*							
Under 5 acres	490 762	540 046	1 265 844	1 818	38 802	20 514	236 634
Between 5 and 12 ½ acres	379 077	543 480	343 162	1 423	47 864	18 244	164 549
» 12 ½ and 50 »	541 840	937 164	336 851	3 785	274 873	52 162	371 663
» 50 and 250 »	172 940	278 799	83 272	8 474	405 293	135 537	290 332
Over 250 »	19 363	7 639	3 342	40 627	181 103	459 003	324 193
Totals	1 603 982	2 307 128	2 032 471	56 177	947 935	685 460	2 387 371
b) *Out of every 100 persons engaged in agriculture the distribution according to size of farm was:*							
				2 and 3			4, 5, 6 and 7
Under 5 acres	18.9	20.8	48.8	69.6	0.1	1.5	0.8	9.1	11.5
Between 5 and 12 ½ acres	25.3	36.3	22.9	59.2	0.1	3.2	1.2	11.0	15.5
» 12 ½ and 50 »	21.5	37.2	13.4	50.6	0.1	10.9	2.1	14.8	27.9
» 50 and 250 »	12.6	20.3	6.0	26.3	0.6	29.5	9.9	21.1	61.1
Over 250 »	1.9	0.7	0.3	1.0	4.0	17.5	44.3	31.3	97.1
On all the farms	17.8	25.6	22.5	48.1	0.6	10.5	7.6	15.4	34.1

In this table are included the persons engaged in forest work on agricultural areas, but the results are but insignificantly affected by inclusion.

The preponderance of women in the two classes of smallest are due to the fact that in the small farms the work is for the most part don the holders themselves with the members of their families, especially women folk (wives, and daughters).

As for the *intensity of the work*, an idea can be gained when the num of persons engaged per area of 100 acres is considered. It appears that number of persons engaged diminishes with the increase of the area of holding. In these figures, however, the real numbers of workers do not ap with exactitude, because in the smaller and middle sized farms there persons returned as present whose work is only partially or not at all dev to farming. The real numbers of workers in the classes of the smaller hold are in reality smaller than those returned.

Acording to the position held in the farms, the statistics distin between: *managers, members of the family* and *labourers*.

The numbers of persons in Prussia on June 11, 1907, belonging to th three groups are shown in Table II.

From the above figures it appears that in the whole State the pers employed in agriculture are to the extent of about two-thirds membe the holders' family and one-third hired labourers. The ratio between members of the holders' family and the strangers varies of course consi ably according to the size of the farm. In the smaller-sized holdings holders and the members of their families prevail, namely for the smal holdings they are 88.5 per cent., for small farms 84.5 per cent., for medi sized farms 72.1 per cent. and for large estates a very low percenta The reverse is the case with hired labour. In the smallest farms it is ployed very sparingly, in medium-sized farms it is 27.9 per cent. of total, and in large estates it attains to 97.1 per cent.

Table II shows the character of the agricultural working popula The members of the holders' families are divided into two main groups: t who are permanently employed on the farms and those only tempor engaged; more than half of the members of families belong to the group. Their number increases generally with the size of the farm, w the temporarily engaged members are found in the greatest numbers in smallest holdings. In these, during ordinary periods but a small am of labour is required, and during the short periods in which there is m work to be done the members of the holders' families assist. Hired la is divided into overseers and accountants, permanently (farm servants maids, and day labourers) and temporarily engaged hands. To the la belong especially non-resident hands.

The first group is an exceedingly small one. The greatest part is for by the permanent labourers, among whom there are more farm serv and maids than day labourers. In each of the classes according to siz farm the distribution of these labourers varies greatly. The proportio farm servants and maids increases with the size of the farm, but dimini

ain in the largest farms, in which the greatest contingent is that of day ›ourers.

This distribution of agricultural labour is of the greatest importance for e study of the labour question. The large estates are especially affected r the want of permanent hands. A sufficient number of farm servants id maids is a vital necessity for large estates, for without them the regular ork of the farm cannot be carried on. This is seen also from the distribution permanent and temporary hired labourers. The latter are relatively more merous in the smaller holdings and diminish with the increase in the size the farm.

The small holdings are in a position to attract outside labourers during busiest periods of the year, when the assistance of the members of the ily is insufficient or not available. For the larger farms a staff of permanent ›urers is absolutely necessary, because they cannot, like the smaller ones, il themselves during the busy time of the temporarily disengaged hands.

The work of children, that is persons under the age of fourteen, is, as y be seen from Table III, an important factor.

TABLE III.

		Numbers of children employed	Numbers of children among 100 persons employed in the corresponding class
Members of the farmer's family	permanently	35 531	1.54
	temporarily	225 732	11.10
Outside labour	permanently	32 150	2.32
	temporarily	54 714	3.24

Lastly the following average figures for the kingdom of Prussia are given o the sizes of the farms.

	Percentage of area
Farms under 12.5 acres	12.9
» between 12.5 and 50 acres	27.7
» » 50 » 250 »	31.3
» over 250 »	28.1

The following figures show the percentage of productive land occupied various crops:

	per cent.
Cereals	48.4
Forage crops	25.8
Potatoes and beets	12.6

The average number of persons engaged on 100 acres of productive id in Prussia is 17.4.

1193 – **The Farmer's Income in the United States.** — SPILLMAN, W. J. in Un *States Department of Agriculture, Bureau of Plant Industry, Circular* No. 132, pp. Washington, July 19, 1913.

The data upon which this article is based are obtained from the cen of 1910, combined with certain factors worked out in the experience of Office of Farm Management in conducting farm management surveys

There are two items of income about which no information is availa *viz.* the value of the milk and cream consumed on the farm, and what farmer earns for work outside his farm ; and one item of expenditure wh cannot be determined, *viz.* the amount paid for live stock. The data sented in the accompanying table should be interpreted in the light of th omissions.

The average area of the American farm in 1910 was 138.1 acres, acres of which are classed as improved land and 49.77 acres as devoted crops. The total average investment per farm is $6 443.67, the amo in farm buildings being $ 994.33 and that in implements and machin $ 198.88.

All the data for the receipts as given in the table were obtained f census returns. The farm is also credited with the total value of all crops produced except that part fed to live stock, which is obtained deducting the value of forage sold from the total value of the forage cr The farm is thus credited with the butter, cheese, eggs, poultry, ho meat, fruits, vegetables, bread, etc., consumed on the farm where it is duced, and the value thus consumed on the farm is included in the f income.

Any revenue from outside sources should be added to the net inc given in Table I.

The expenses for labour, fertilisers and fodder are obtained from census returns also. The cost of maintenance of farm buildings is pl at 5 per cent. of their value, and that of implements and machinery (inc ing repairs) at 20 per cent. of their cash value, both figures being base extensive investigations by the Office of Farm Management, and agre with the estimates in Warren's " Farm Management ". Taxes are assu to be 0.6 per cent. as an average for the whole country.

The remaining items of expense in the conduct of a farm are col ively calculated as 15 per cent. of other expenditure, which is the ave obtained from a number of farm management surveys conducted by Office of Farm Management. The total farm expenses, omitting the of live stock purchased, amount to $340.15.

The farm income is obtained by deducting the total expenses from total receipts, and amounts to $640.40. Assuming 5 per cent. as the of interest to which the farm investment (of $ 6 443.67) is entitled, the income is then distributed between interest and labour income as follo Interest on investment, $ 322.18 ; labour income $ 318.22.

The average farm mortgage based on the number of all farms, is $ which at 6 per cent. per annum amounts to $102.90. Deducting th mount from the farm income of $ 640.40 we get $537.50 (to which mus

TABLE. — *Labour income of farmers in the United States.*

Item		Total	Amount per farm
ber of farms		6 361 502	
roved land . . . . . acres.		478 451 750	75.2
al farm investment		$ 40 991 449 090	$ 6 443.67
stment in farm buildings		$ 6 325 451 528	$ 994.33
stment in implements and machinery		$ 1 265 149 783	$ 198.88
Receipts.			
ry products (excluding milk and cream used at home)		596 413 463	$ 93.75
k		65 474 328	10.29
air		901 597	0.14
s produced		306 688 960	48.21
ltry raised		202 506 272	31.83
ey and wax		5 992 083	0.94
estic animals sold		1 562 936 694	245.69
estic animals slaughtered		270 238 793	42.48
al value of all crops . . . . . $ 5 487 161 223			
. . . . . 1 438 583 919			
. . . . . 414 697 422			
y 92 458 571			
etc. 824 004 877			
value of crops			
d for feeding . . 2 769 714 789			
sold 509 253 522			
alue of crops fed	2 260 461 267		
alue of crops		3 226 699 956	507.22
Total gross farm income . . .		6 237 850 146	980.55
Expenses.			
ur		$ 651 611 287	$ 102.43
isers		114 882 541	18.06
		299 839 857	47.13
tenance of buildings (at 5 %)		316 272 576	49.72
tenance of implements and machinery (20 %) . .		253 029 956	39.78
(0.6 %)		245 947 694	38.66
Total		1 881 584 911	295.78
llaneous expenses (15 % of other expenses) . . .		282 237 736	44.37
Total expenses . . .		2 163 822 647	340.15
Summary.			
gross income		$ 6 237 850 146	$ 980.55
expenses		2 163 822 647	340.15
Net farm income . .		4 074 027 499	640.40
st on investment (at 5 %)		2 049 572 454	322.18
Labour income . . .		2 024 455 045	318.22
st on mortgage ($ 1 715 at 6 %)			102.90
lable for purchase of live stock and for family living			537.50

added the value of milk and cream consumed on the farm and any out income) as the sum to be used in the purchase of live stock, in living expen and in savings.

As the majority of farmers are capitalists, the interest on capital stitutes part of the income and the labour income is undoubtedly smaller t it would be if the farmer did not also have the interest on his capital. T we find that in the better agricultural sections, the labour income of ten is considerably higher than that of farmers who work their own fa though the latter may have larger total incomes than the tenants. fact a large number of American farmers live on the interest of their inv ment and do not receive anything for their own wages. But this is possible on the small farm, where the interest is too small to adm high standard of living, and the farmer must have some labour inc in addition.

In America it is reasonable to infer that at least half the farm fam of the country have incomes smaller than those given in Table I. In dual farmers here and there have larger incomes than this average, but facts presented in the table indicate that on the whole the income of fan in this country, even when we include as a part of the income those th consumed on the farm where they are produced, is certainly not more t sufficient to pay 5 per cent. on the investment and ordinary farm wage the labour they do, and it is probably considerably less than this.

1194 – **Notes on Tobacco-Growing in Germany.** — LANG, H. Einiges aus dem G der deutschen Tabakstatistik. — *Fühlings Landwirtschaftliche Zeitung*, Year 62, Pa pp. 409-426. Stuttgart, June 13, 1913.

The number of German tobacco-growers has much decreased du the last 20 years, for while in the five years 1891-1895 there were 151 390 sons growing this crop in the district under the jurisdiction of the Ger Customs, the figures for the subsequent periods of five years were as follo

1896-1900 : 136 352
1901-1905 : 108 606
1906-1910 : 95 369

The tobacco growers have thus progressively decreased in the pr tion 100 : 90.1 : 71.7 : 62.9. The following table gives the details of decrease in the principal tobacco-producing districts of Germany:

Years	Prussia			Baden			Bavaria	Alsace-Lorraine	
	Number of planters	in % of the total number of the Empire	in % of the numbers of the first 5 years' period	Number of planters	in % of the total number of the Empire	in % of the numbers of the first five years	Number of planters of the numbers o first five years' p		
1891-1895	82 962	54.8	100	37 469	24.8	100	100	100	
1896-1900	68 444	50.2	82.5	39 125	28.7	104.4	91.4	89.2	
1901-1905	49 445	45.5	59.6	34 694	31.9	92.6	83.0	71.7	
1906-1910	37 582	39.5	45.3	34 316	36.0	91.6	79.9	64.9	

he area cultivated by each tobacco-grower has, however, considerably sed, and consequently the total area under tobacco has decreased in ortion very different from that in which the number of cultivators has shed. The cultivated area was as follows:

1891-1895	43 021 acres
1896-1900	44 748 »
1901-1905	39 908 »
1906-1910	37 647 »

he decrease occurred in the following proportion 100 : 104.0 : 92.7: The increase or decrease of the area under tobacco in the various ts is shown by the following table.

TABLE II.

Years	In % of the total under tobacco in the Empire		In % of the area under tobacco in the different districts during the first five years.					
	Prussia	Baden	Prussia	Baden	Bavaria	Alsace-Lorraine	Wurtemburg	Hesse
895. . . .	29.2	39.9	100	100	100	100	100	100
900. . . .	29.8	41.2	106.3	107.5	94.8	102.0	105.5	95.7
905. . . .	29.1	41.0	92.6	95.4	88.8	96.4	80.5	83.4
910. . . .	25.8	43.3	77.3	95.0	85.5	101.7	85.8	83.8

consequence of the decrease in the area under tobacco, and owing fact that the yield per acre has rather diminished than increased, tal production of tobacco, after a temporary rise in the second five- eriod, fell considerably in the two succeeding five-year periods, as is by the following figures:

	Amount of tobacco gathered (dry)	
	Absolute amount	Relative amount in % of the first five-year period
1891-1895	722 767	100
1896-1900	742 320	102.9
1901-1905	695 382	96.2
1906-1910	599 049	82.9

he proportions for the various States are given in Table III.

TABLE III.

	Prussia	Baden	Bavaria	Alsace-Lor
1891-1895	100	100	100	100
1896-1900	96.8	109.0	98.1	104
1901-1905	90.2	100.8	95.5	100
1906-1910	74.0	86.7	83.8	97.

While the production decreases, the price of tobacco rises, and as latter movement is relatively stronger than the former, the result is a crease in the total value of the crops.

TABLE IV.

	Total value of annual tobacco crop in Germany £	General movement	Increase and decrease in the various State				
			Prussia	Baden	Bavaria	Alsace-Lorraine	Wurtemburg
1891-1895 . . .	1 434 097	100	100	100	100	100	100
1896-1900 . . .	1 484 798	103.5	94.4	112.2	101.8	103.0	99.5
1901-1905 . . .	1 436 863	100.1	90.7	105.0	103.2	109.7	90.1
1906-1910 . . .	1 536 658	107.1	92.2	112.8	114.2	129.3	109.3

The average crop per surface unit has, on the whole, remained the same ; it was as follows per acre throughout the Empire :

1901-1905.	16.81 cwt.
1906-1900.	16.61 »
1901-1905.	17.44 »
1906-1910.	15.93 »

Great variations have been found in the yield per acre in differen tricts. If the average crop in each period of five years is taken at 10 yield per acre is as given in Table V.

TABLE V.

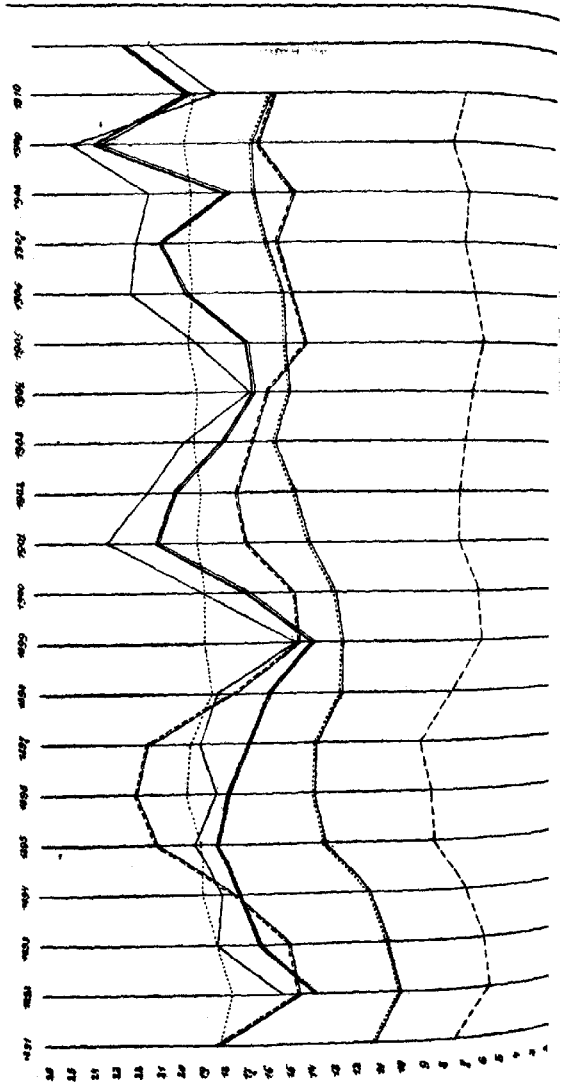
	Prussia	Baden	Bavaria	Wurtemburg	Alsace-Lorraine	Hesse
1895 . . .	96.9	102.3	as a rule from 6 to 10 % below the average for the Empire	102.3	124.4	80.2
1900 . . .	90.3	105.6		104.9	128.7	79.5
1905 . . .	91.1	104.6		107.1	126.8	84.4
1910 . . .	98.6	99.5		109.4	127.2	77.0

The average price of tobacco has risen thoughout the Empire during four five-year periods to 39*s* 8*d*, 40*s*, 41*s* 3*d*, and 51*s* 3*d* respectively. It thus increased proportionately from 100 to 100.9, 104.1 and 129.1. money return per acre has also notably increased. It rose from £33 7*s* the first five-year period, and £33 3*s* 9*d* in the second, to £36 0*s* 6*d* and 16*s* 6*d* in the two last periods. The proportion is thus 100 : 99.5 : 9 : 122.3. Nevertheless, the different States have taken very unequal ts in this development, as is shown by Table VI.

TABLE VI. — *Value of the crop per surface unit in % of the value of first five-year period.*

	Prussia	Baden	Bavaria	Wurtemburg	Alsace-Lorraine	Hesse
1-1895	100	100	100	100	100	100
6-1900	88.7	104.2	107.3	94.3	101.0	100.3
1-1905	97.8	110.0	116.5	111.9	113.6	123.0
6-1910	119.1	118.7	133.7	127.1	127.0	133.1

The value of the tobacco produced per surface unit varies much from year to another ; these fluctuations not only cause uncertainty and iety to the growers, but have a considerable influence upon the general iative of the planters. After some good seasons, the area under tobacco nce increases, not only because new cultivators add fresh plantations hose already existing, but also from an extension of the former tobacco-ls. On the other hand, after some bad seasons, not only do many plan-abandon the undertaking, but those who remain faithful to the industry uce the area under cultivation. The writer gives a graphic representa-



of this movement in the German Empire and the Grand Duchy of Ba-
(The double lines refer to the former, and the single lines to the latter),
graphic curve gives the amount realized each year by the tobacco yield
ie hectare (2.47 acres) : the figures at the extreme left each represent
marks (about £5). The two curves referring to the Empire and the
id Duchy of Baden (continuous lines) are displaced by a column — that
say by a year — towards the right. This is done in order to show more
ly that the crop obtained one year has an undoubted effect upon the
placed under tobacco the next year, and that this occurs with the ut-
: regularity. As for the area under tobacco in any given year (broken
), the figures on the extreme left each represent 1000 ha. (2470 acres),
e in the case of the figures relating to the area cultivated by each planter
ted lines), every figure represents one are (4 rods).

AGRICULTURAL INDUSTRIES.

- A Practical Formula for the Calculation of the Solids not Fat in Milk. — HÖYBERG, M. H. in *Zeitschrift für Fleisch- und Milch-hygiene*, Year 23, Part 23, pp. 339-341. Berlin, September 1, 1913.

The formula given by the writer is based upon the same principle as of Bertschinger, viz :

$$\text{Solids not fat} = \frac{\text{degree of lactodensimeter} + \text{percentage of fat}}{4}$$

If, for instance, the specific gravity of the milk is 1.034 and the fat con-
: 2.8 per cent, the solids not fat $= \frac{34.0 + 2.8}{4} = 9.2$.

This formula has the advantages of being simple and accurate, and of
ng quick results.

Also, as is seen by the experimental data reproduced in Tables I, II, III (1), it is superior to Ackermann's automatic calculator, and espe-
ly adapted for testing doubtful milk.

(1) The Tables 1 and 2 are reproduced in a slightly abridged form.

TABLE I. — *Results obtained from samples of doubtful milk.*

Milk — No.	Specific gravity	Fat — %	Quantity of solids not fat		
			according to chemical analysis	according to the new formula	according Ackerman automati calculat
1	1.0270	2.38	7.34	7.34	7.47
3	1.0300	2.70	8.07	8.17	8.30
4	1.0257	3.00	7.11	7.17	7.27
6	1.0312	2.24	8.43	8.36	8.49
8	1.0326	2.02	8.68	8.65	8.85
9	1.0293	3.08	8.05	8.09	8.20
11	1.0257	2.71	7.25	7.10	7.21
12	1.0275	2.79	7.41	7.57	7.68
14	1.0295	2.21	8.02	7.92	8.06
16	1.0268	2.66	7.17	7.36	7.48
17	1.0308	2.26	8.41	8.26	8.39
19	1.0287	2.38	7.34	7.77	7.90
20	1.0292	2.64	7.79	7.96	8.08
22	1.0296	2.40	7.83	8.00	8.13
24	1.0292	2.16	7.63	7.84	7.98

TABLE II. — *Results obtained from samples of normal milk.*

Milk — No.	Specific gravity	Fat — %	Quantity of solids not fat		
			according to chemical analysis	according to the new formula	according Ackerman automatic calculat
1	1.0330	3.44	9.12	9.11	9.19
3	1.0320	4.14	9.06	9.03	9.07
4	1.0315	4.19	8.96	8.92	8.96
6	1.0330	3.04	9.06	9 01	9.11
7	1.0320	3.23	8.77	8.80	8.91
9	1.0310	3.27	8.47	8.56	8.78
11	1.0315	3.21	8.83	8.67	8.77
12	1.0325	3.38	9.10	8.97	8.78
14	1.0315	3.21	8.83	8.67	8.77
15	1.0320	2.97	8.98	8.74	8.85
16	1.0320	3.14	9.02	8.78	8.90
17	1.0320	3.00	9.02	8.75	8.85
18	1.0320	3.22	8.51	8.80	8.91
20	1.0320	3.51	8.59	8.87	8.95

TABLE III. — *Results obtained with samples of half milk.*

Milk — No.	Specific gravity	Fat — %	Quantity of solids not fat	
			according to chemical analysis	according to the new formula
1	1.0288	0.89	7.45	7.41
2	1.0342	0.91	8.72	8.77
3	1.0340	0.97	8.35	8.74
4	1.0262	0.88	6.66	6.67
5	1.0292	0.94	7.58	7.53
6	1.0349	0.90	8.91	8.95
7	1.0362	1.05	9.11	9.31

- The Specific Gravity of Cow's Milk and the Change it Undergoes Shortly After Milking. — FLEISCHMANN and WIEGNER in *Journal für Landwirtschaft*, Vol. 61, Part 3, pp. 283-323. Berlin, July 21, 1913.

Quévenne, the inventor of the lactodensimeter, had already observed in the course of the first 4 to 6 hours subsequent to milking, the specific gravity of cow's milk increased on the average 0.0008 to 0.0015, when was kept at a temperature below 30°C. Opinions have hitherto been divided as to the causes of this property possessed by milk. Quévenne, and later Reiss and Sommerfeld, thought that this increase in specific gravity occurred through the volatilization, immediately after milking, of gases present in solution in the milk. Bouchardat considered the increase in specific gravity to be due to a molecular change in the structure of the sugar of milk. Other investigators attributed the phenomenon to a specific movement of the fat globules. Recknagel, Kirchner and Fleischmann considered that the casein globules expanded further. Lately, the alteration in the volume of the fat globules has often been cited as the cause of the change in the specific gravity of milk. So far, however, the literature dealing with the subject has furnished no reliable data based on accurate investigations.

The writers have subjected to rigorous examination all the accounts the experiments hitherto made to elucidate this circumstance, and to the same end have themselves carried out exhaustive investigations in the Laboratory of Milk Chemistry at the Göttingen University. The results prove that the hypothesis of gas volatilization does not explain the phenomenon. Alteration in the milk sugar or movement of the globules, such as could increase the specific gravity, was observed. No support was found for the theory of the expansion of the casein globules which was put forward by Recknagel. The writers, however, observed the existence of a certain inter

relation between increased specific gravity and the presence of fat globule When, for instance, the milk was kept for 22 hours at the same tem perature as at the moment of milking, no increase in specific gravity w noticed. The specific gravity of milk which had been recently milked an then cooled down to 3°C., increased 0.0015; on the milk being subs quently warmed up to 45°C., the specific gravity sank to what it was befo Skimmed milk did not increase in specific gravity even after a longer tim or after having been cooled to a lower temperature. The larger the fat co tent, the higher the increase in specific gravity if the milk was kept belo the melting point of the butter fat. Kept at body heat, milk with a hi or with a low fat content underwent no change in its specific gravity. So dified butter fat possesses a higher specific gravity than liquid butter fa The specific gravity of emulsions of fat and water is less than that of fa

The temperature oscillations of the milk globules were produced wi the same rapidity as those of the milk plasma. The writers have come to t conclusion, as a result of their researches, that the increase in specific gravi which occurs in the case of milk which has recently been milked, is al to the coagulation of the fat globules present.

1197 – **Practical Methods for the Determination of Fat in Cheeses. Compa of the Methods in Use, with Special Regard to the New Processes of K and Wendler.** — HERRAMHOF, H. in *Molkerei-Zeitung*, Year 27, No. 54, pp. 1054. Hildesheim, July 16, 1913.

The writer speaks of the methods most usually employed for the de mination of the fat in cheese, *viz.* those of Siegfeld and Gerber; he comp them with Kooper and Wendler's methods and gives the results of comp tive experiments, comparing the data thus obtained with the results of Bondzinski-Radzlaff method. He thus shows, that for the analysis cheese rich in fatty matter, the Siegfeld method and those of Kooper Wendler are as suitable, and give almost as accurate results, as Bondzinski-Radzlaff process. The Kooper method is the one most adap for the estimation of fatty matter in cheeses which are poor in fat.

1198 – **The Consumption of Meat and Milk in Japan in 1911.** — *The Annual Re of the Central Sanitary Bureau of the Imperial Japanese Government for the 44th Ye Meiji* (1911), pp. III + 73 + 172 + 106. Tokyo, 1913.

The number of slaughter-houses existing at the end of 1911 was 4 of which 219 were public, and 276 private. The number of animals slau tered is given in Table I:

The average annual consumption of meat per inhabitant in 1911 w 2.74 lbs.

The number of animals prohibited to be slaughtered after examinat was 460 bullocks, 46 calves, 54 pigs and 316 horses. The number of a mals ordered to be entirely thrown away after slaughtering was 193 bullo 6 calves, 47 pigs and 17 horses, while that of those of which only parts w thrown away was 5165 bullocks, 92 calves, 2296 pigs and 1181 horses. sides these there were some cases where the viscera only were ordered to thrown away.

TABLE I.

	No. of animals slaughtered	Weight of meat — lbs.	Average weigth of meat per animal — lbs.
cks	262 588	97 640 000	371.84
s	21 858	2 395 600	109.60
) and goats	2 488	24 350	25.73
	198 423	23 415 500	118.01
es	66 555	16 527 500	248.33

At the end of 1911, there were in Japan 5691 dairy-farms; these produced during the year 10 113 000 gallons of milk, which corresponds to an annual consumption per head of 1 ½ pint. Compared with the previous year, there was an increase of 2.6 per cent. in the number of dairies, and of 9.8 per cent. in the production of cow's milk. The prefectures of Hyogo, Tottori, and Kagoshima produced 7 460 gallons of goat's milk, that is four times as much as in the preceding year. There were 47 condensed milk factories, which turned out 1 480 000 lbs.

Table II gives the amount of milk and of condensed milk produced in the chief dairy prefectures.

Prefecture	Milk — galls	Condensed milk — lb.
yo	1 748 000	70 250
ka	655 000	17 930
go	432 700	2,740
ma	241 900	156 250
ba	110 900	273 850
i	491 100	—
oka	331 800	663 800
aguchi	163 550	122 500
kaido	461 400	131 500

1199 – **Annual Wool Review for Australasia.** — *Dalgety's Review* (Australasi *Annual Wool Number* 1913, p. 83. Sydney, July 1, 1913.

The total quantity of wool of Australasia exported has been 2 247 3 bales or 721 821 516lbs., as against 2 537 867 bales or 840 694 748lbs. in 1911-1 To arrive at the actual production it is necessary to add the amou of wool used by manufacturers in Australasia, namely, 87 775 bales 28 175 775 lbs. The result shows the actual production of wool for the p twelve months to have been 2 335 040 bales or 749 997 291 lbs., as agai 2 637 127 bales or 873 549 808 lbs. in 1911-12.

The average weight per bale of the past clip as dealt with in Aust lasian markets is 321.2 lbs., as against 331.2 lbs. for the previous ye 332.1 lbs. for 1910-11, 335.5 lbs. in 1909-10, 330.6 lbs. in 1908-9, 333.7 in 1907-8, and 339.7 lbs. in 1906-7.

It will be seen that the decreased average weight of the bales during past wool year has been 10 lbs., whilst compared with six years ago the crease in weight is no less than 19.7 lbs.

Sheep numbers as at the close of the year show the very serious fal off of 9 809 634 head, as compared with the same point twelve months ag and it will take a succession of good seasons to regain the lost ground. D tails as to the number for each State compared with those returned at t end of the two preceding years are shown in Table I.

TABLE I.

States	1912	1911	1910
New South Wales	39 436 118	45 032 022	45 825 3
Victoria	11 892 224	13 857 804	12 937 5
Queensland	20 248 580	20 387 838	20 153
South Australia	5 481 487	6 267 477	6 432
West Australia	4 593 458	5 408 583	5 137
Tasmania	1 800 000	1 788 310	1 735
Commonwealth	83 451 867	92 742 034	92 241
New Zealand	23 750 153	24 269 620	23 792
Australasia	107 202 020	117 011 654	116 034

The average price per bale realised for the 1 804 801 bales sold in tralasian markets has been £13 13s 1*d*, which compares with £11 1

11-12, £ 12 10s 4d in 1910-11, £13 12s 2d in 1909-10, and £ 12 9s 0d for ast thirteen years.

The value of the clip sold in Australasia during the past year has nted to £ 24 642 643, whereas during the previous year 1 926 926 bales ed £22 682 090, and in 1910-11 the 1 865 167 bales sold realised 46 602. The average number of bales sold in the Australasian markets g the past seven years has been 1 719 066, and the average realisation 86 002 per annum.

The past clip was composed of 69 per cent. merino, and 31 per cent. ored, a slight increase in the proportion of crossbred as compared with revious year, when the respective proportions were 72 and 28 per cent. lip of 1910-11 was composed of 76 per cent. merino, and 24 per cent. ored, while in 1908-9 there was 78 per cent. of merino and 22 per of crossbred.

The comparative failure of the 1912 lambing is revealed by the quantity nbs' wool sold in Australasia during the past twelve months, which nted to 65 106 bales, as compared with 93 050 bales for the preceding n, 98 314 bales for 1910-11, 108 808 bales in 1909-10, 69 456 bales in 9, and 70 980 bales in 1907-8. The proportion of lambs' to fleece was cent., as compared with 5 per cent. for the two preceding years, and cent., 4 per cent., 5 per cent., and 7 per cent. respectively for the years before that date.

The quantity of scoured wool sold in Australasian markets has been 11 bales, or 8 per cent. of the total wool sold, which compares with 46 bales, or 7 per cent., in 1911-12; 160 326 bales, or 9 per cent., in 11; 195 241 bales, or 10 per cent., in 1909-10; and 177 877 bales, or r cent., in 1908-9.

Experimental Contributions on the Subject of the Disinfection of Hides d Fleeces containing Anthrax Spores. — SÉVCIK in *Zeitschrift für Infektions-rankheiten, Parasitäre Krankheiten und Hygiene der Haustiere*, Vol. 13, Part 6, pp. 322-48; Part 7, pp. 429-452. Berlin, June and July 1913.

An account of culture experiments and experiments on animals under- for the purpose of testing the methods adopted by Seymour-Jones and ttenfroh for the disinfection of hides and fleeces containing anthrax s.

t was shown that a 0.02 per cent. solution of sublimate, as recom- ed by Seymour-Jones for dried sheep-skins and large hides, is unre- and that ox-hides, even if placed in a solution of sublimate ten times ong and left there for 48 hours, are not necessarily free from infection. chattenfroh's method was perfectly satisfactory for the sterilization nea-pig and rabbit skins, but was not efficacious in the case of ox-hides rease-free sheep-skins. On account of its cheapness and the small nt of danger it entails, this system is to be recommended for the steri- n of small skins.

1201 – **Notes on the Vine-Growing Districts of Chile** (1). CANU, G. (Dir the Oenological Station of Chile) in *Annales de la Science Agronomique*, Ye No. 5, pp. 351-365. Paris, May 1913.

Vine-growing is one of the most ancient and most important indus of Chile.

Conditions of vine-cultivation. — A large portion of Chile lies betw the 30th and 38th degrees of south latitude which delimit the area whi essentially suitable to vine cultivation. This area is bounded on the by the Andes, while on the west, the temperature is regulated by the sence of the Pacific Ocean. This vast zone enjoys an exceptional cli and is free from hail storms. The rainy season coincides with the wi the long summer is hot and dry, spring frosts are rare, and cryptogami seases infrequent. *Oidium* exists, but though sulphur dustings are c carelessly carried out, this fungus does little harm. Mildew is practi non-existent. On the other hand, anthracnose has made its appear in several departments. Further, *Conchylis ambiguella*, *Haltica ampelop Eudemis* (*Polychrosis*) *botrana* and *Oenophtira pilleriana* are unknow Chile, though other parasites exist there, such as *Phytopt us vitis*, *Tar chus* sp., *Tylenchus* sp. and even *Margarodes viticum*. To all the a advantages Chile possesses should be added a plentiful supply of wate least in the valleys where most of the vineyards are situated. The stre descending in large numbers from the Andes permit of the system irrigation of the vines according to the requirements of the diff vineyards.

Methods of vine-growing and wine-making. — These vary acco to the several zones. If the old vines of the country, owing to their planting, do not receive all the attention they require, the new F vines, which are planted in lines and supported by iron wire, are, as a carefully tended as regards the cleanliness of the soil, and are systemat pruned. Further, while the cellars belonging to the old Spanish vine are nearly all badly constructed and provided with very primitive those properties are numerous where the cellars are carefully made an furnished with all the appliances which are requisite for handling the and for subsequent work in the cellar.

The Wine-making Station of Chile has greatly contributed to th provement of the methods of work, by its critical studies of the wines, its repeated advice, and by the publication of numerous instal plans. Further, by means of lectures held on the spot in the different growing regions, and an incessant propaganda, it encourages and pro industrial methods of wine-making.

Chilian wines. — From certain French vines, *viz.* Cabernet, M Cot, Verdot, there are produced in the neighbourhood of Santiago, espe in the "Llano de Maipo" and the "Llano Subercaseux", full-bodi wines, of relatively good quality and bouquet, which resemble Bor

(1) See No. 1638, *B.* Dec. 1912.

ork up fairly quickly, but improve little on keeping. From Pinot-noir gathered before it is over-ripe, and treated with care, relatively light are produced; these are good in quality and have a delicate flavour, hat resembling Burgundies.

peaking generally, in the same zone, the white wines are inferior to the Sémillon, in particular, is nearly always deficient in mellowness. other hand, some cellars produce from Pinot-blanc a very mellow with a pleasant bouquet. Some experiments should be mentioned were made with wines resembling certain types of Sauternais. By t was proved that with a little method and perseverance it is possible ain wines possessing bouquet and preserving a certain amount of . The following table gives the analyses of wines made from differ- es, for the purpose of determining a few of the chemical characteris- these products. The wines analysed were new, as a rule.

TABLE I. — *Wines from the neighbourhood of Santiago.*

omposition	Cabernet	Pinot	Meriot	Verdot	Romano	Sémillon	Sauvignon	Pinot blanc	Folle blanche
. . . . .	995.2	995.4	994.7	994.8	995.6	992.0	992.0	991.4	995.8
per cent. in vol.	11.8	12.5	12.2	11.0	12.4	12.1	10.9	12.0	10.4
at 100°, per 1000	24.34	26.12	22.18	17.44	26.66	16.68	12.2	13.04	21.00
ng substances in se per 1000 . .	2.17	2.47	2.17	1.92	2.97	1.92	0.78	1.43	1.78
es in Potassium ates, per 1000 .	0.55	0.54	0.39	0.33	0.37	0.40	0.32	0.37	0.59
d tartar per 1000	3.06	2.46	3.13	3.57	3.81	2.53	3.13	1.78	3.96
l matters p. 1000	2.42	2.56	2.82	1.96	1.44	1.50	1.36	1.48	2.04
cidity in H_2SO_4 000.	2.94	4.13	3.80	4.04	4.86	4.74	4.09	3.76	5.45
: acidity, in O_3 per 1000 . .	0.31	0.49	0.30	0.39	0.40	0.34	0.74	0.82	0.67

nother important vine-growing zone is that of "Lontué" and a." The crops are often larger than those in the neighbouthood of ago, especially in the first of the above localities. The wines are less blic and poorer in dry extract; they are also inferior in quality. Table ntains some types of analyses of the wines of this district.

TABLE II. — *Lontué Wines.*

	Cabernet	Pinot	Cot	Merlot	Sémillon
Density [1]	944.5	993.4	994.3	995.4	993.0
Alcohol per cent. in vol.	11.8	11.9	11.2	11.2	12.7
Extract at 100°, per 1000	21.12	16.78	20.34	22.90	19.40
Reducing substances, in glucose per 1000	1.66	1.85	1.47	0.78	2.25
Sulphates, in potassium sulphate per 1000	0.35	0.34	0.30	0.49	0.33
Cream of tartar per 1000	3.65	2.61	3.21	3.43	2.53
Mineral substances per 1000	2.30	2.04	2.42	2.70	1.24
Total acidity, in H_2SO_4 per 1000	3.92	3.19	3.35	4.53	4.11
Volatile acidity, in $C_2H_4O_2$ per 1000	0.41	0.32	0.35	0.79	0.30

TABLE III. — *Wines of the Coast Cordilleras.*

	Red wines of the country — Provinces of			Sémillon	White wines of th — Provinces	
	Linares	Maules	Con-cepcion		Linares	Maules
Density	995.2	997.5	996.1	991.2	993.0	996.4
Alcohol per cent. in vol.	10.9	12.2	9.2	11.4	11.8	10.3
Dry extract at 100°, per 1000	19.74	28.68	17.84	23.35	14.50	21.0
Reducing substances, in glucose per 1000	1.41	4.34	1.85	1.07	1.78	1.8
Sulphates, in potassium sulphate per 1000	0.45	0.31	0.24	0.22	0.20	0.2
Potassium bitartrate per 1000	4.03	4.40	2.33	2.68	2.91	3.2
Mineral substances per 1000	2.80	3.12	2.92	1.40	1.92	2.4
Total acidity, in H_2SO_4 per 1000	3.68	3.56	2.21	3.60	3.35	4.0
Volatile acidity, in $C_2H_4O_2$ per 1000	0.54	0.56	0.85	0.47	0.74	0.5

he district producing inferior wines is chiefly that known as the Coast lera, which includes the provinces of Linares, Macule and Concepcion. ally it is the hill slopes that are planted with vines ; these vineyards t watered, as the rainy season in this part is prolonged till sufficiently to the spring. French vines are here relatively rare, the old Spanish ies being still cultivated. They yield larger crops than the French but the wines made from their grapes are flat, without freshness or et. Table III gives some examples of the composition of these wines. amples were taken from new wines before the first racking.

pecialities. — To the north of Santiago, in the Provinces of Acon- a and Coquimbo, the crop is used for the elaboration of special pro- "chichas", liqueurs, raisins and brandy. "Chicha" is an exclu- Chilian product ; it is grape-juice concentrated at 12°, 13° and 14° é by being placed over an open fire out of doors, and then left to fer- spontaneously. This agreeable beverage is sold when it sparkles ly and has lost some of its sweetness, but has not yet acquired a high ol content. "Chicha" is made throughout Chile, but this northern with its different grapes (Alexandrian Muscats, white, yellow, rose, n, and other Muscats, Torontes, etc.) produces a kind which is espe- prized.

TABLE IV. — *Composition of Chichas.*

	Santiago	Buin	Naucagua	Cauquenes	La Calera
y.	1 036.4	1 057.5	1 027.6	1 040.0	1 080.0
l per cent. in vol. . . .	7.2	6.5	9.0	10.1	3.0
tract at 100°, per 1000 . .	114.30	—	—	179.90	217.80
ing substances, in glucose 1000	95.6	117.60	84.4	171.00	207.00
e per 1000.	53.7	87.37	64.35	93.60	127.90
se per 1000	41.9	30.23	20.05	77.40	79.10
l substances per 1000 . .	2.24	2.32	2.10	2.06	7.62
of tartar per 1000. . . .	3.13	4.12	3.73	4.78	6.51
ic acid per 1000.	0.85	1.29	0.96	0.72	1.03
acidity, in H_2SO_4 per	3.84	4.28	4.21	4.82	5.46

The sweet wines and liqueur wines produced in the Province of quimbo are not without their good qualities. Aromatic brandies kn as " piscos " are also made in this district.

Raisins. — In Huasco and Elqui, raisins are made from Alexan Muscats grown on trellises on the slopes at an altitude of from 33 5 000 ft. The climate there is particularly dry and warm. The grape gathered when fully ripe. They are hung up in special rooms, where dry by the action of the natural circulation of the air. In two mo the grapes are dry ; they are then passed through boiling water for o two minutes, and are subsequently drained, dried and packed.

Area under wines, and vine production. — The area planted in may be estimated at 250 000 acres ; the vineyards are nearly equal vided into irrigated and non-irrigated plantations. The so-called vines occupy a surface of 160 500 acres, as against 56 500 acres planted French varieties. The average production is about 154 million gall the whole number of vineyards.

Consumption and exportation. — At the present time, the Chilian are mostly consumed in the country. But it is interesting to not there is also a considerable exportation of liqueur wines to Germany. of a good brand are those chiefly exported to Uruguay, Argentina, Bolivia and Brazil.

The value of the vines. — The value of the vineyards per acre, irrigated zones, amounts as a rule to from £80 to £128 according district, the quality of the soil, distance from the railway, etc. In n gated zones, the value varies between £16 and £32.

1202 – **The Wines of Tokay and a Comparison with those of Sauternes.** — La in *Revue de Viticulture*, Year 20, Vol. XL, No. 1024, pp. 129-135. Paris, July

The temperate district of Tokay-Hegyalja, in Hungary, is note very excellent liqueur wine prepared from more or less shrivelled not attacked by *Botrytis cinerea* (" Edelfäulniss " (1).

Producing district. — The district of Tokay-Hegyalja, the Côte Hungary, is situated in the North-East of the kingdom in the Co Zemplén, comprising some 30 communes including these of Tokay ; t must be added one commune in the County of Abanj-Torna thus 31 communes.

Tokay-Hegyalja is a range of hills extending from the extremit great plain of Hungary some distance from the Carpathians, for s miles, and containing an area of 12 450 acres of land occupied b cultivators.

The total production of this area averages about 1 760 000 and occasionally reaches 2 640 000 gals. Of this total only about one one third reaches the high quality required for export, and of the e wine 95 to 98 per cent. is of the Szamorodni or Maslás brand ; th

(1) See No. 418 *B.* April 1913.

akes up the remaining 2 to 5 per cent., the real essence of Tokay ery rare.

e principal vine grown in Hegyalja is the Furmint, of which there ral varieties, all thick-skinned fruit free from moulds and suitable for dried grapes. Amongst the varieties of Furmint are the following: Blanc, Muscat Jaune (which gives the celebrated Asszu de Muscat), eaf, Goat's Udder. They all ripen early; in good seasons some egin to colour at the end of July, and all are ripe in September.

qualities of wine are made in this district, from the ordinary Tokay, o the rare Essence.

linary wines. — These are made from bunches containing no shri- grapes, or from which the shrivelled ones have been removed; al- ordinary table wines, they have a very rich flavour.

sence of Tokay. — The shrivelled grapes are gathered separately and in a vat having a small outlet at the bottom; through this flows ery concentrated juice, obtained by the pressure of the grapes them- This juice gives the Essence of Tokay, which is very rich in sugar, ntains little alcohol; in time it takes on a very marked aroma and uisite flavour; it is always rare.

szu wine. — This is the best-known of the Tokay wines, and is much ated as a dessert wine. It is prepared from a mixture of shrivelled shrivelled grapes; the greater the proportion of the former, the richer ie. For a very sweet wine, 5 hottes (2 to 3 ½ bushels) of shrivelled are added to one barrel (28 to 30 gallons) of must. Asszŭ wines ssed according to the number (2, 3, 4 or 5) of hottes of shrivelled added to each barrel of must. The shrivelled grapes are first of all d alone in a vat and the resulting mass is thrown into another vat, with the correct amount of must and stirred vigoronsly; it is set or 12 to 48 hours according to the temperature, after which it is put gs, trodden, and pressed; then the juice drawn off is put into casks.

rditás. — The residue from the bags is placed in another vat and a r quantity of common must is added. After thorough mixing, the s left together for 4 or 5 hours, and is then put into bags and trodden. sidue is then pressed and a liquid obtained which produces a very vine but of less value han Asszu.

amorodni Wine. — This is prepared from bunches whose grapes dy shrivelled; they are trodden in bags and treated in much the same for Asszu. The residue is used in the making of Forditás.

tsás wine. — To prepare this, good Hegyalja wine is poured onto remaining after drawing off the Asszŭ or Szamorodni wines. In this e wine remaining in the lees is used to improve the ordinary table

mposition of the Must and the Wine. — Table I gives the composi- a sample of 1906 must (density = 1,113) from the vineyard of n (Tolcsva).

TABLE I.

	Grams per 100 c.c. of must.
Extract	29.41
Reducing Sugar { levulose	13.46
Reducing Sugar { glucose	12.94
Total acidity (as tartaric acid)	0.80
Total tartaric acid	0.547
Acid other than tartaric	0.007
Cream of tartar	0.404
Tartrates of alkaline-earths	0.217
Ash	0.290
Phosphoric acid	0,069
Polarimetric rotation	12.12°

TABLE II. — *Composition of shrivelled grapes from the same vine in the same year.*

	per 100 kg.
Skins (moist)	5.633
Seeds	6.083
Water	6.083
Extract	63.550
Sugar { levulose	26,676
Sugar { glucose	26.299
Extract (sugar free)	10.299
Total acidity (as tartaric acid)	1.603
Free tartaric acid	0.00
Tartar	2.281
Ash	1.681
Phosphoric acid ($P_2 O_5$)	0.148

Fermentation of the Must. — The fermentation of the must in the Hegyalja districts, is generaly catried out in cold cellars, so that the of high sugar content ferment slowly. The wines are thus made slowl keep on improving in delivacy and aroma for years.

The Asszů wines of Tokay vary in colour from golden yellow to l They have a peculiar sweetness resembling that of honey, and very c teristic flavour and aroma. The Szamorodin wines are generally not or only slightly so; they have considerable strength, a yellow or yel brown colour and a very characteristic flavour. They contain 13 per cent. of alcohol, while the Asszů wines, being much sweeter, c only 10 to 13 per cent.

Comparison of the wines of Tokay with those of Sauternes. — Ta gives the anlayses of representative types of the wines of Tokay and e us to make comparisons with the white wines of Sauternes ma different methods.

LE III.—*Composition of wines of Tokay (Kramszky) in grams per* 100 *c.c.*

	Ordinary wine of Tokay-Hegyalja from Tarczal, 1901	Szamorodni from Sarospatak 1902	Aszú wine (gbotten) from Tarczal, 1901	Aszú wine (gbotten) from Tallya, 1899	Essence from Tokaya, 1901
l: Volume per cent. .	14.39	14.77	12.23	13.13	7.11
. . . . .	11.42	11.72	9.70	10.42	5.64
, total (C_4 H_6 O_6) .	0.76	0.94	0.96	0.62	1.23
, volatile (C_2 H_4 O_2)	0.13	0.10	0.15	—	0.21
, fixed (C_4 H_6 O_6) .	0.60	0.82	0.77	—	0.97
t	3.16	7.78	18.74	9.26	33.73
ing bodies	0.29	2.60	13.40	5.75	25.77
se.	0.16	1.82	6.85	2.88	13.90
se.	0.03	0.68	6.45	2.77	11.87
ine	1.08	1.48	1.80	—	1.45
ic acid, total	0.28	0.19	0.19	—	0.15
ic acid, free	0.08	0.00	0.00	—	0.00
tes of alkaline earths.	0.07	0.16	0.13	—	0.05
. . . . .	0.16	0.04	0.09	—	0.13
n.	0.02	0.015	0.03	—	0.024
. . . . .	0.16	0.185	0.24	0.20	0.30
boric acid.	0.028	0.042	0.062	0.045	0.041
metric rotation . . .	—0.14°	—1.38°	—3.15°	—1.30°	—7.04°

Comparison of the Tokay wines with those of Sauternes.—The analyses ese various wines allow a comparison to be made between those of the y district in general and the famous white wines of Sauternes, of which nethod of preparation is quite different. Table IV contains analyses me types making a series as similar as possible to the Tokay series in r and alcohol content. The figures refer to 100 c. c. of wine.

No. 5 is a "head wine", harvested under conditions quite analogous to of the Essence of Tokay, and made from over-ripe grapes without any

TABLE IV.

	No. 1.	No. 2.	No. 3.	No. 4.	No.
Alcohol, volume per cent . . .	14.8	13.8	13.8	12.9	6
Reducing sugar	0.550	2.630	7.140	14.070	39.
Extract at 100°	2.320	5.780	10.300	19.620	.
Extract, reduced.	1.840	3.250	3.260	5.650	.
Acidity, total ($C_6H_8O_8$) . . .	0.682	0.787	0.750	0.550	0.
Acidity, volatile ($C_2H_4O_2$) . .	0.050	0.070	0.080	0.085	.
Glycerine	11.465	1.465	1.815	2.450	0
Proportion alcohol-glycerine . .	3.080	13.270	16.440	24.020	13
Cream of tartar	0.118	0.115	0.140	0.135	
Ash.	0.325	0.455	0.500	0.500	0
Rotatory Power	— 1	— 1	— 31	— 73	

appreciable action of *Botrytis*, that is simplyshrivelled. (1) No. 4 is a "
wine harvested in the same year with a very pronounced developme
the fungus. Nos. 2 and 3 are "middle" wines and No. 1 a "tail" wi
of good years.

Comparing the figures of the two tables, it is seen that in the
ternes wines with equal or higher sugar content, the alcohol cont
greater than in the Tokay wines; the initial sugar content of the must
therefore have been greater also; for No. 5 this figure works out at 5
per litre, whilst for Essence of Tokay it is about 370 gms., or about the
as Sauternes wines from grapes attacked by *Brotrytis*.

The fact that the fermentation goes equally far, and sometimes fi
at Sauternes than at Tokay, in spite of the excess of sugar, is probab
to the warmer autumn in the Gironde.

The acidity of the two wines shows little difference, but it is
ally somewhat less in the Sauternes. This is chiefly a quest
the variety, though increased by the neutralizing action of the *Botry*

In both cases the reduced extract is very high, and glycerine
a considerable part of it. The proportion of glycerine per 100 of
varies from 10 to 25 and this ratio varies directly with the quality of th
except in the case of exceptional wines like Essence of Tokay.

(1) The year 1893 was very dry right on to September, and the *Botrytis* rot
appeared by the time the grapes for this wine were gathered.

The writer explains the large amount of glycerine in Sauternes wines, firstly he presence in the must of ferments capable of producing considerable ities of glycerine, especially when acting in very concentrated musts; also because, before fermentation begins, more than 1 per cent. ycerine is found in the musts, which must have been produced by the n of *Botrytis cinerea* on the sugar of the grape.

The Tokay wines are richer in tartaric acid than the Sauternes, because atter are more alcoholic, and *Botrytis cinerea* neutralises some of the ity of the fruit.

A more obvious difference exists between the ash contents, those of Sauternes being twice as great as the Tokay figures. One of the most ortant influences in this direction is the concentration of the juice of es attacked by *Botrytis*, which is greater than when they are simply velled.

Again a very noticeable difference is accounted for by the use of sul- tous acid. The sulphurating of the stock is an indispensable operation le vinification of Sauternes ; and it is owing to the presence of sulphurous that the wines acquire and retain their wonderful properties. The addi- of sulphurous acid to the Tokay wines in sufficient quantity would serious inconveniences, since the development of the aroma in the is dependant on energetic oxidation, which would be hindered by the nce of sulphurous acid.

Of the French wines, those of Montbazillac have most resemblance in a, taste and colour to the wines of Tokay.

- Influence of Ferments on the Variations in Dry-Extract and Glycerine in Wine. — VENTRE, J. in *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, Vol. 157, No. 4, pp. 304-307. Paris, July 28, 1913.

During a course of researches carried out with the object of ascertaining action of some elliptical ferments on the general constitution of wine, writer was surprised to find that the ferments do not all behave in the manner towards the extractives of grape must. His experiments lead to the following conclusions :

1) Every ferment has a specific action on the extractives contained in must. Some, the Champagne ferment in particular, seem to produce sible diminution in the dry extract, comparable with the dilution pro- d by certain ferments in brewing. The Médoc ferment on the contrary ys gives a greater proportion of dry extract, without there remaining nsequence non-utilized reducing matter in the medium.

2) It would be interesting to know the variety of yeast which has formed a must into wine, especially for research in adulteration by tion of alcohol ; it would suffice if this attenuation of the dry extract sponded to a high degree of alcoholic strength for the wine to be de- d as one containing added alcohol.

3) The addition of sulphurous acid to the must diminishes to a great nt the attenuating power of certain ferments, especially that of Cham-

The writer proposed to investigate the cause of this diminution of extract and was led to determine the glycerine, with the following resul

a) Glycerine of organic origin is closely dependent on the ferment act on the medium. The proportion of glycerine formed varies between and 4.1 per cent. of the initial weight of sugar in white wines, and tween 3.6 and 4.2 for red wines.

b) In media to which sulphurous acid has been added, the quanti of glycerine produced were sensibly the same in all the experiments, wh ever ferment was used. The proportion varied between 3.53 and 3.7 cent. for white wines and 3.5 and 3.68 for red wines.

c) The variations of glycerine in the same medium are, according t author's experiments, less than those found by M. Laborde, who rep considerable variations, according to the ferments, namely 2.5 to 7.7 cent. of the weight of transformed sugar.

1004 – **Plum Brandy. Improvements in its Manufacture.** — Ellrodt, G. in *schrift für Spiritusindustrie*, Year XXXVI, No. 30, pp. 373-374 + 2 figs. July 24, 1913.

Plum brandy is manufactured in the Southern States of Germ chiefly by small farmers who frequently possess only small badly e ped distilleries.

The raw material consists of the fruit of different varieties of plums (Zwetschen or quetsches, fruits of *Prunus domestica* and *P. a mica*) and also the different varieties of round plums (Pflaumen). The of the product depends chiefly on special aromatic substances in the f on the content of amygdalin and on the method of preparation. The co of sugar, the most important constituent in distillation, varies muc cording to the variety of fruit and the degree of maturity. Accordi König it varies between 6.44 and 25.62 per cent. and averages 14.7 cent. The yield of alcohol varies considerably in consequence, and on account of different methods of manufacture, which in some leries have remained unchanged for a century. The fruit is ger crushed, stones being left intact in two-thirds of the mass, crush the other third. In several districts however this last operation practised.

The crushed fruits are placed in barrels or cement troughs a lowed by means of the ferments adhering to the fruit to ferment taneously. Lactic and acetic acid bacilli also develop in the ma may check the development or even destroy the natural ferme the fruit by an excessive production of acid. The result is that t mentation of the sugar is incomplete and that a portion of the alc transformed into acetic acid if the fermented mass is kept any le time.

Experiments have been made to accelerate the fermentation addition of beer yeast and to check the bacterial action or dimin effects. All these experiments gave increased yields of alcohol, but th ity of the final product was inferior to that produced by normal fer

Some distillers have used compressed yeast. Better results might btained by the use of wine ferments in place of beer yeast either or compressed.

The enormous loss of alcohol which may result from spontaneous entation has been ascertained by experiments made at the Distil- Institute ("Institut für Gärungsgewerbe") at Berlin. The distil- ho brought material to the Institute complaind that the yield of ol was exceptionally small without apparent reason.

It was found that a good deal of fallen fruit was used in the prepara- of the must, with the result that a much greater number of micro- nisms were introduced into the liquid, thus incresing the danger of tion.

Analysis of the must gave the following results.

TABLE I.

Density of fermented must	6.6° B.
Acidity	5.46°
» as acetic acid	1.658 gm. in 100 c. c.
Alcohol in filtrate	5.1 per cent. by volume
Unfermented sugar	0.6 per cent.

Calculating the quantity of acids corresponding to 100 c.c. of alcohol, xceptionally high figure of 32.11 gms. is found. Allowing for the already present in the sweet must, which is not inconsiderable, remains a loss of about 20 per cent. of the total sugar due to the ation of acid.

Microscopic examination showed that the lactic and acetic acid organ- were numerous and fully active and that the ferment had been de- ed some time. To the loss of alcohol due to fementation, the loss to distillation must probably also be added, because in some cases pparatus used was very defective and often without an agitator. is case, in order to prevent the fermenting mass from sticking to alls of the still and burning, it is necessary to open the still in order ir up the contents, which results in a considerable loss of alcohol. the means of determining the end of distillation is often so unsuit- that frequently alcohol remains in the residue.

Considering the high acid content of the fermented must, the writers ned from the distiller samples of the first distillation (crude product), f the second distillation (rectified) and tailings of the refined product de vie fine). The analyses are given in Table II below.

hese results show that only a very small proportion of the enormous ity of acid in the fermented must passes into the rectified product. t the fermented must contains 36.04 gms. of acid per 100 c. c. of

TABLE II.

	Eau-de-vie crude	Eau-de-vie rectified	Tailings
Results obtained:			
Specific gravity at 15° C.	0.978 226	0.927 230	0.980
Percentage of alcohol in volumes determined with the alcoometer . . . . . %	17.7	54.36	15.
Acids, as acetic, in 100 c. c. . . . . gms.	0.216	0.066	0.1
Index of total ethers.	20.1	38.3	6.(
» » volatile »	18.6	38.3	6.(
» » fixed »	1.5	—	—
Hydrocyanic acid, free. . . . . mgm.	traces	0.75	0.5
» » combined	1.25	2.50	—
» » total	1.25	3.25	0.5
Furfurol reaction	present	present	prese
Results calculated per 100 c.c. of absolute alcohol:			
Acetic acid . . . . . gm.	1.121	0.121	0.81
Index of total ethers.	113.5	70.04	39.1
» » volatile »	105.0	70.04	39.1
» » fixed »	8.5	—	—
Hydrocyanic acid, total . . . . . mgm.	7.06	5.97	3.26
» » combined	7.06	4.59	—
» » free	—	1.38	3.26

alcohol, the crude spirit contains 1.40 gm. and the rectified spirit 0.121. Of the ether which has passed into the crude product, none of the fi substance and only a portion of the volatile, passes into the recti liquid. Only combined hydrocyanic acid is present in the crude sp and a small quantity of the free acid in the rectified product, and free acid alone in the tailings. This suggests that a hydrolysis of cyan compounds takes place during rectification, and explains why differe

igators have not been able to demonstrate the presence of free cyanic acid in plum brandy, because the quantity probably depends e degree of rectification to which the liquid has been subjected. n conclusion, only a small part of the great quantity of acids produced reign organisms during fermentation finds its way into the rectified ly. There is no definite ratio between the formation of ethers and that ds. In avoiding the development of acids by means of pure ferments, as ently practised of late, there is no risk of producing an inferior brandy. ct it is probable that the use of pure ferments of superior wines (which rt to their products a fine characteristic aroma) would improve the ty of the brandy: at any rate the yield would be considerably ased.

PLANT DISEASES

GENERAL INFORMATION.

1205 – **The First International Conference of the " Defensa Agricola " at Montevideo** (1). — Conferencia Internacional de Defensa Agricola. — *República Oriental del Uruguay, Revista del Ministerio de Industrias*, No. 1, May 1913, pp. 77-84, 1 pl. Montevideo, 1913.

On the initiative of the Government of Uruguay, the First International Conference of the " Defensa Agricola " was held at Montevideo from May 2 to 10, 1913. The Ministers of Foreign Affairs and of Industries of the Republic were Honorary Presidents (their delegate, Dr. Ed. Acevedo being Acting President). The following States of South America were represented by their delegates and by experts: Argentina, Colombia, Chile, Paraguay, Brazil, Ecuador, Bolivia, Peru and Uruguay.

The text is given of the three Conventions drawn up by a technical commission and approved in final form by the International Conference. The first Convention consists of 15 articles, and deals chiefly with the damage caused by the locust *Schistocerca paranensis*. It arranges for an International Commission to be held before August 25 at Asunción, Paraguay, the objects of the latter are to study the centres of distribution and the concentration and diffusion zones of this locust and to propose (if it appeared necessary after a preliminary enquiry) the creation of a Central International Station with sub-stations for the purposes of *a*) determining geographically the concentration zones of *Schistocerca paranensis*; elaborating and presenting a control system suitable for the concentration zone, and (after the acceptance of this system) the directing of the necessary operations; *c*) informing all the countries interested of the movements of the swarms in order that they may take the necessary measures; *d*) drawing up and distributing frequently to the respective Governments reports on operations carried out, and upon everything which can be tried for the destruction of this injurious insect.

Matters relating to the pecuniary assistance and the reciprocal collaboration of the various contracting States were also settled, in so far as these concerned the working of the International Commission, the four

(1) See also No. 183, *B.* Feb. 1913.

nd work of the Stations, the carrying out of a common control system, rganisation of a service of telegraphic information respecting the ıtions of the locusts, and the exchange of information at the close of season.

By the provisions of the second Convention, which consists of 10 es, the contracting States undertake to establish inspection services eir respective territories for the purpose of defending the interests of ulture against plant pests. The latter are defined as follows: para- weeds, injurious birds and other animals, and all causes of patholo- conditions, or of injury caused by cryptogams, insects and other als, when they have assumed or threaten to assume a propensity for ding likely to cause serious damage to plants.

As a result of the creation of the above-mentioned services, and for urpose of the export, import and transit of agricultural produce, tates undertake to declare which ports are open to such importation and the measures of control to which these products will be subjected; ndertake to authorize no despatch of goods to the signatory tries, unless the prescriptions of the inspection services of the said tries have been carried out, and only to accept certificates given ficial agents. The States will advise one another as to the officials orized to issue such certificates, and respecting any modifications changes in the latter. These certificates should contain a declaration the original plantation or nursery is free from disease, and give the e of the owner or occupier of the land, its situation, the number species of the plants, the port of loading and unloading and the name ddress of the consignee.

urther, the States are expected to communicate to one another the and regulations on the inspection service and any modifications of me, likewise the existence and development of diseases, the occur- of new diseases, and the disappearance of those already known, as s every occasion of the refusal or destruction of imported products, the origin of such products, and the reasons necessitating the res in question.

he second Convention also fixed that the second International Confe- of the "Defensa Agricola" should be convoked and organised by the ıtine Government, and held at Buenos Ayres. In conclusion, it provi- r the installation at Montevideo of a permanent International Bureau, ficina"), entrusted with the supervision of the execution of the deci- made, and to serve as an intermediary between the different bureaus Officinas tecnicas de Defensa Agricola" of the various adhering coun-

This Bureau will consist of an agricultural engineer chosen by Uruguay Government, and of diplomatic representatives of all the tries of South America already accredited to the Government of that blic. The working expenses will be divided proportionally among ontracting countries. The directing Committee of the Bureau will up the regulations.

The third Convention announces in the text that: On the denunci tion or request of any one of the Governments, the other contracting cou tries shall be obliged to take prohibitive measures against the import tion of easily-propagated diseases which are unknown in the produci signatory countries, and this so long as they occur in the said countri and provided there are no practical measures of efficaciously disinfecti the substances which may convey the said diseases.

DISEASES NOT DUE TO PARASITES AND OF UNKNOWN ORIGIN.

1206 – **The Cause Determining the Chlorosis of American Vines and the Me of its Control.** — ACCARDI, SALVATORE. *La clorosi delle viti americane*, 10 Naples, 1913.

Chlorosis, especially in the case of American vines, may be transit if it depends on cultural defects, or permanent, if it is due to the composi of the soil. Temporary chlorosis may be treated by abundant manur Permanent chlorosis, in the opinion of the writer, should be mainly tributed to an insufficient absorption of magnesium on the part of the pla

Magnesium is not wanting in any soil, but the carbonic acid circu ing with the water in the soil dissolves with difficulty the double carbo of magnesium and lime (dolomitic). When the magnesium occurs in form, if any plant has not the power of directly decomposing this comp by means of the acid contained in its roots, it is deficient in the am of magnesium necessary for the formation of its chlorophyll; hence development of chlorosis.

The analyses made by Averna and Rossi show that Berlandieri its hybrids contain more acid than Rupestris and Riparia, and also the Berlandieri group has a greater power of decomposing the double bonate of lime and magnesium than that possessed by other American v it is to this circumstance that it owes its chlorosis resistance (1).

Since however, according to Comes (2), nitrogenous substan general, and manure in particular, diminish the acidity of the sap by ing a larger amount of oxydases, especially in warm soils, it follows soils which produce permanent chlorosis must never be treated wit kind of nitrogenous manure. Phosphates (which maintain the ac should be used, together with such quantities of magnesium as are p necessary by local experiments.

In conclusion, it should be noted that though ferrous sulphat useful remedy for temporary or transitory chlorosis, it is of little e in the case of permanent chlorosis, owing to its weak action in disp magnesium on being applied to the soil, and its slight and momen catalytic effect when it reaches the chlorotic leaves.

(1) See No. 495, *B.* March 1912; No. 788, *B.* July 1913.

(2) See No. 881, *B.* July 1913.

- **On the Presence of Endocellular Fibres in Healthy Vines and in those attacked by « Bramble-leaf ».** — MAMELI, EVA in *Rendiconti delle sedute della Reale Accademia dei Lincei, Classe di Scienze fisiche, matematiche e naturali*, Series 5, Vol. XXII, First Half-year, Part 12, pp. 879-883. Rome, 1913,

In this preliminary note, the writer, basing her remarks on the results ndies made upon healthy and infected American and European vines, s that the presence of endocellular fibres, which is considered by Petri is the "constant index" of the "bramble-leaf disease" ("roncet" irtnoué", etc.) is not in her opinion "a symptom which is closely ected with the actual cause of the disease". Such fibres occur fre- tly, according to the writer, in healthy American and European vines, ell as in conifers and other plants, as has been demonstrated by Sanio, , Müller, Raatz and Penzig.

In healthy vines, the writer states, the endocellular fibres occur equally e higher and lower portions of the plant, and are found as frequently he lower internodes as in the upper ones; while according to Petri se anomalies occur in the upper internodes only in plants which long been affected", and "when the fibre formation takes place e same time at the summit and base of the plant, the injury is more l and more serious"

BACTERIAL AND FUNGOID DISEASES.

- **Recent Researches on Vine Mildew (*Plasmopara viticola*).** — Communicated by Dr. GY. DE ISTVÁNFFI, *Professor at the University, Director of the Royal Hungarian Ampelological Institute, and* GY. PÁLINKÁS, *Assistant.*

Development of mycelium and conidia. — The germinating tube of the ores of *Plasmopara viticola* always penetrates the green parts of the t through a stoma; in the cavity below the stoma the hypha swells derably and the whole of the protoplasm collects in this swollen part: secondary spore thus produced soon throws out a haustorium, which trates the nearest cell of the parenchyma, and then develops a narrow (3 to 5 μ), which ramifies in the intercellular spaces and produces haustoria. By the third day a definitive mycelium is formed. As the pores send out hyphae which penetrate several stomata, each "grease " is caused by as many young mycelia as the zoospores which succeeded ntering. The growth of the hyphae is generally in a radial direction obstructions such as vascular bundles are met with by a flattening out e hypha and the development of narrow hyphal threads which pass e or below the vein and continue their way as before.

The mycelial threads may take the form of 1) cylindrical tubes, sinuous narrow-walled; 2) vesicular tubes with irregular swellings (during damp her: coralloid type); or 3) slightly flattened tubes often tapering and

) See No. 968, *B.* June 1912; No. 1349, *B.* Sept. 1912; and No. 67, *B.* Jan. 1913 [*Ed.*].

with irregular dichotomous branching. The hyphae are always aseptate and never join together. The nuclei (1.5 to 3 μ) are numerous and scattered irregularly; they form clusters at the bases of the branches and the tips of the young hyphae. Generally they are round, but when developing rapidly they become fusiform in shape.

The haustoria occur irregularly and are sometimes united in groups. Haustoria with long pedicels were previously unknown. They also possess a nucleus, which ultimately divides.

After the mycelium has developed, it sends out smaller filaments into the stomatic chamber, which form conical masses and raise the surrounding tissue. Under favourable conditions (heat and sufficient moisture) thin filaments from these hyphal masses pass out through the ostiole of the stoma, become swollen and present the appearance of young conidiophores, either 1) isolated, 2) joined together in a strawberry-like mass, or 3) with the extremities forming pear-shaped swellings which give rise to conidiophores. When these filaments begin to extrude, the nuclei advance in quantities, and the dense protoplasm containing them passes into the branches.

After a short period of growth a slight swelling appears just below the tip, and into it the protoplasm condenses. At the time of migration the nuclei are in a rapid state of division and are fusiform, elongated or horse shoe shaped. In the course of the development of these swollen parts (which represent the stems of young conidiophores), appear first primary and later secondary branches which terminate in trifid sterigmata. (At the base of these branches we have observed finger-like bodies, hitherto unknown, which are probably rudimentary sterigmata). Fructification begins immediately, the first conidia forming after 4 to 6 hours on the sterigmata of the lower branches. Under favourable conditions fructification is completed within 10 or 12 hours.

We have observed by staining that the first protoplasm to pass into the sterigma to the young conidium is not very dense; it is followed by a denser part, generally containing the nucleus. This nucleus then divides several times. In the development of the conidia there are three distinct periods: 1) the conidium has reached its full size and the nuclei begin to divide, though the conidium is not ripe; 2) after 3 or 4 hours from the appearance of the young conidia karyokinesis ceases; the conidia are not ripe and if placed in water cannot produce zoospores for a long time; 3) the protoplasm takes the form of a network, the nuclei take up definite position and the conidia become fully matured. These facts account for the variation in virulence and the numerous differences recorded by various observers concerning the liberation of the zoospores.

The practical importance of this is that the conidia only become virulent after a period of about 24 hours. Thus it follows that the conidia produced in the morning after evening rain, cannot produce infection until rain also falls during the afternoon or night following. Thus fresh infection may be avoided by spraying immediately. With a mist the conidia may begin to germinate even before dropping from the conidiophores, which explains why mists are so harmful.

We have already (1911) described the cover or lid of the conidium. g germination this lid is forced up by the zoospores, which then effect escape.

t a temperature of 6° to 8°C. they maintain their vitality for 3 to 8 , but do not survive drought for more than 5 days; dry weather follow- undant rain is particularly destructive of thin-walled conidia.

n studying the effect of copper salts, we find, 1) that a solution of 1 0 000 of copper sulphate hinders germination, but that the conidia can nate in a solution three times as concentrated as that indicated by det and Gayon; 2) that in the most dilute solution the formation spores is considerably retarded (as much as 12 hours).

n artificial media the development of zoospores ceases at the time of tion from the conidia, which has been observed to take place after hours in the different solutions employed (bouillon, sweet wort, liquid re, hay extract, etc.), diluted from 5 to 10 times.

. *The period of incubation.* — This is defined as the period between the k of the zoospores and the appearance of the first symptons of the di- on the plant (grease-spots on the leaves; yellowish-brown spots on the ues, tendrils, etc.).

The length of the incubation period depends on the temperature and dity of the surroundings; for leaves it diminishes as spring advances; the beginning to the middle of May it is 15 to 18 days; at the end of 12 to 15 days; at the beginning of June, 11 to 13 days; at the middle ne, 9 to 11 days; at the end of June, 6 to 7 days; and in July and Au- 5 to 6 days, provided the weather is normal.

On the bunches the duration of incubation varies as follows: from the of May to the beginning of June, 12 to 14 days; at mid June, 9 to 11 ; at the end of June, 10 to 12 days; in July 12 to 14 days. It is longer to 5 days if the infection takes place on the stalks of the grapes or on ain stalk of the bunch, as in this case the mycelium has to traverse the mediate tissues, so that in July the period of incubation may be from 19 days.

During warm weather the incubation period may be so much shortened, abundant rain, that the grease-spots do not show before the mildew ks out. In this case the period of incubation on the leaves is 10 to 12 at the end of May, 8 to 10 days at the beginning of June, 6 to 8 days mid June to the end of the month and 4 or 5 days in July and August; e branches it is 9 to 11 days in the first half of June, 7 to 9 in the second and 8 to 10 days in July. In such cases the vine growers believe that tion takes place during the rain on the day previous to the appearance e mildew. This idea is erroneous, as infection always takes place 4 to 6 sooner, and rain immediately before the appearance of the symptoms ease has only the effect of reducing the period of incubation.

3. *Grease spots.* — These are the yellow or pale green transparent spots h appear on the green parts of the diseased plant immediately after the lopment of the mycelium, owing to destruction of the chloroplasts. he fruits and old shoots the point of infection assumes a greyish or

brownish tint. The true "grease spot" appears along the edges and
of the leaf.

The shape and size of the spots depends generally on the weather,
variety and the growth of the leaves; in cold or wet weather the spots
large and round; with drier weather they are smaller and more angu
on susceptible vines they are larger than on resistant varieties. After
appearance of the spots the first rain starts the development of conidiopho
which form the mildewed appearance on the diseased patches. The for
tion of the mildew is dependent upon the humidity; in dry weather
takes from 4 or 5 days to 12 or 20 for its appearance, and if there is no
at night it may not appear at all.

4. *Infection experiments.* — All the young and green parts of
vine (including leaves half an inch in length) can be infected in the la
ratory as well as in the open air. The success of the infection depends
the state of the plant, the virulence of the conidia and the local conditio
Infection can be produced on the surface of the leaf, but only along
larger veins and indentations. The susceptibility of the plant depends
the supply of water in the organ, the vapour tension in the stomatic cha
bers and intercellular cavities generally, the turgescence of the cells, and
some extent on the chemical composition of the cell sap.

In June 1911 we carried out artificial infection experiments on
bunches in the open air and described them in August of the same year.
found that infection rarely takes place on fruits the size of a pea, beca
of a suppression of some of the stomata.

By means of conidia preserved for 3 weeks in an ice-room (at 0° to 8°
we have been able to cultivate the fungus throughout the winter on fre
branches; by retarding the appearance of the mildew we have succeeded
preserving the mycelium in the "grease spots" in a latent condition du
7 or 8 weeks. Under suitable conditions of warmth and humidity the i
bation period is the same under glass as in the open.

5. *Bearing of the incubation period on practice.* — Attacks of mil
take place after rain, thick fog or heavy persistent dew; the appearance
the mildew also occurs after rain; consequently the development norm
depends on two rainfalls. It is therefore necessary to apply the sulph
at least after the appearance of the grease spots.

To detect the presence of the grease spots, before their appearance
the vineyard, the suspected leaves are first sprinked with water and t
covered up and kept in a warm dark place. The bunches are wrapped
in moist filter paper and placed in a warm damp chamber. After a few d
the mildew breaks out on the suspected material and the disease is ea
recognised.

6. *Use of the incubation calendar and trials.* — The grower should
any appreciable rainfall (say half an inch) between the end of April and
beginning of May and allow for the incubation period 15 to 18 days.
gives the date of appearance of the grease spots due to infection from wi
spores. He must also notice if the temperature falls below 10°C. (50°
as the disease cannot develop below this temperature. The artificial

hould be made 5 or 6 days and again 2 or 3 days before the expiration
: date of incubation (with both leaves and fruits).
n calculating the date of incubation, only the rainfall of two or three
duration may be taken together and the period must be reckoned from
rst day of rain. From mid-June onwards even small showers must be
ned. Heavy showers are the most dangerous, and it is then that the
ies require attention.

. **Conditions Favourable to the Development of Mildew.** — MENGEL, O. volution du Mildew suivant les Conditions de Milieu. — *Comptes Rendus hebdomadaires des séances de l'Académie des Sciences*, 1913, Second Half-Year, Vol. 157, No. 4 July 28, 1913), pp. 292-294. Paris, 1913.

From observations made in France it appears that infection by mildew
: to *a*) general causes; *b*) secondary causes depending on the nature
itality of the vine, and on its adaptation to local conditions, such as the
osition and exposure of the soil; *c*) accidental causes (such as manure,
, drainage of the soil, etc.).
is the general causes are bound up with atmospheric variations, mete-
gical observations are required to provide warnings and timely infor-
n. Preventive measures can always be successful in normal years
periods of infection do not overlap each other, as happened this year
ussillon (Pyrénées Orientales).
For secondary and accidental causes, it is necessary to make researches
the variations in the development of the disease. For example, the
y Grand-noir will remain free from disease though surrounded by the
ian variety badly infected; and the Carignan of Salanque (1), growing
l of normal humidity, will be protected from infection by treatment
copper sulphate, owing to its adaptation to the local conditions, whilst
oland variety of Carignan, growing in soil accidentally inundated, would
e double the treatment.
ince the spores of mildew, like those of all Phycomycetes, are disse-
ed by the least breath of wind, one would expect to find them in
ent numbers to cause infection in any position. The writer has
ent evidence for believing that a district previously infected with
sease is not more liable to infection than any other, provided that the
conditions previously favourable to the development of the disease
ger exist. Nor does he think that a hill-side situation is more liable
ction when it faces winds coming from previously infected areas. Fur-
n Roussillon this year the prevailing winds during the infection period
from the sea and the most badly mildewed districts were precisely
which were exposed to these sea breezes almost free from contamina-
ith spores; this is accounted for by the writer as being due to the
damp breezes accelerating the germination of the spores; no doubt
e rigorous treatment with the fungicide would have kept it in check.
he vine-grower should therefore be acquainted with the modes of

(1) Coast plain of the Pyrénées Orientales. (*Ed.*).

action of these secondary and accidental causes and be able to act accor
ingly. It is well known that tillage during the period of infection is
sastrous; consequently this operation must be postponed, or if urgent
needed, a dressing of sulphate of copper must follow immediately behind
plough. In manured vineyards it will be advisable to double the treat
or to partially defoliate the plants to let more air into the bunches.
this way the accidental causes are prevented from creating local conditi
similar to those of the general causes.

1210 – **Comparative Spraying Experiments with some Commercial Fungic**
— BRETSCHNEIDER, ARTUR, Vergleichende Versuche mit einigen Spritzmitteln g
die Blattfallkrankheit (*Peronospora viticola* De Bary) des Weinstockes. — *Zeits*
für das Landwirtschaftliche Versuchswesen in Oesterreich, Year XVI, Part 6, pp. 71
Vienna, 1913.

In 1912 comparative experiments were carried out in various parts
Austria with Bordeaux mixture (1-2 per cent.) and the following commerc
fungicides: "Floria-Kuperseifenbrühe" (3 per cent.), "Forhin" (1-2
cent.; but the formula does not correspond with that given by the make
and "Perocid" (1-2 per cent.), chiefly against attacks of vine mild
(*Plasmopara viticola*), but also (at Znaim) against *Pseudoperonos*
cubensis on Cucurbitaceae and certain fungi on fruit trees (*Fusicladi*
Monilia, etc.).

The wetting power of all these preparations was found to be very go
The writer does not consider the visibility of the spray on the leaves v
important; for this point Bordeaux mixture comes first, followed in or
of merit by "Floria-Kupferseifenbrühe", "Perocid", and "Forhi
For rapidity of preparation, the order is: "Floria-Kupferseifenbrüh
"Forhin", "Perocid". All the solutions were neutral and harmless
plants, with the exception of "Forhin" on one occasion, and they had
vantages over Bordeaux mixture in being ready for immediate use and
requiring testing for neutrality. They were also generally in a very
state of division. Bordeaux mixture at 2 per cent. alone gave thoroug
satisfactory results in 1912 as a fungicide. With all the other preparat
the mildew developed more or less vigorously. Arranged in order of m
with regard to their fungicidal properties they are as follows: Borde
mixture at 2 per cent., then at some distance Bordeaux at 1 per c
"Forhin", "Floria-Kupferseifenbrühe" and "Perocid". The inferio
of the last-named mixture is due to the low concentration of the liquid.

"Floria-Kupferseifenbrühe" and "Forhin" are the most experi
and "Perocid" the most economical in price.

1211 – **Some Interesting Cryptogamic Diseases which Appeared in Hun**
in 1912. — PATER, B. Mykologisches aus Ungarn. – *Zeitschrift für Pflanzenkrankh*
Vol. XXIII, Part 5, pp. 260-262. Stuttgart, August 20, 1913.

The year 1912 was the most favourable for the development of cry
gamic diseases which can be remembered in Hungary. The writer,
carried out some researches at Klausenburg (Kolozsvár), records from
place eight species of fungi, all interesting from different points of v

Puccinia graminis ; this appeared for the first time on rye, after the had sought for it in vain for about 20 years ; the harm caused was, er, not great.

Puccinia Malvacearum, also observed for the first time, on marsh v (*Althea officinalis*). It attacked, but only slightly, plants of one f age ; those from 4 to 5 years old were immune.

Epichloe typhina, already recorded before 1912 as occurring on *yrum repens* ; this fact is doubly interesting, because on the one hand ngus had not yet been registered in the literature on the subject, the other, the parasite proved useful in arresting the development of ed, preventing it flowering and fruiting.

Puccinia bullata, very common on cultivated specimens of *Conium atum* as in 1911 ; the uredospores appeared in May, and the teleuto- during the second half of August, not only on the stems and leaves, so on the inflorescences.

Plasmopora nivea on the same plants of *Conium* ; wild individuals Umbellifer growing close to the cultivated specimens remained en- immune, and as the latter were growing in rich well-manured soil, ears that their excessive vigour rendered them more susceptible to ttacks of the disease.

Phoma foeniculina, very common on fennel, as in 1911 ; the infected ore smaller and fewer seeds than the healthy ones.

Puccinia Menthae on *Mentha canadensis* var. *piperascens*.

Oidium quercinum on oaks ; these have been attacked by the fungus 910 ; the old trees were immune.

***Sclerotium Oryzae* on Rice in India.** — Shaw, F. J. F. A Sclerotial ase of Rice. — *Memoirs of the Department of Agriculture in India*, Vol. VI, No. 2, 11-23, 1 fig., plates I-III. Calcutta, July 1913.

erotium Oryzae was first described by Cattaneo in 1879 as damaging Novara and Lombardy. It was discovered in Japan in 1910 by and during the past year it has been found in various parts of India. fected plants can be distinguished from their healthy neighbours ormally prominent tillering, a fact that appears to have been over- by previous workers. Later the infected culm gradually turns yel- d dies and the ears are poorly developed and empty. Within the stem at the base a dark greyish web of hyphae is visible with small sclerotia dotted over the surface.

e writer describes his preparations of the fungus in pure culture and earance on various media. Inoculations of the pure cultures on ste- dlings gave positive results.

e author concludes by pointing out the differences between his ations and those of previous workers on allied species and draws on to the interesting changes in colour and form of the hyphae grown different media.

medial measures against such a parasite as this do not appear to be able, and the writer suggests the breeding of resistant varieties as y method of dealing with the disease.

1213 – ***Lasiodiplodia Theobromae*** **parasitic on Cacao in Dahomey.**
BERTHAULT, PIERRE. Sur une maladie du Cacaoyer dans l'Ouest Africain. – *Bu*
nomie Coloniale, Bulletin mensuel du Jardin Colonial, Nouvelle Série, Year 1, N
pp. 8-14, figs. 1-3. Paris, July 30, 1913.

The cacao plantations in Dahomey have been ruined by a disease kn
locally as " sun-stroke " or " apoplexy ", which attacks the root, trunk
branches and destroys in a few days otherwise healthy and productive tr
As a result of his examination of the disease the writer concludes tha
is due to a parasite, *Lasiodoplodia Theobromae* (Pat.) Griffon et Maubl.

He suggests experiments to test the efficacy of copper mixtures
lime-sulphur, and disinfection of the soil by carbon disulphide injecti
Further studies on this subject are required.

1214 – **" Soft Rot " of Bulbs of *Ixia maculata* and *Gladiolus Colvillii*
duced by *Bacillus Ixiae* n. sp. and *Pseudomonas Gladioli* n. s**
SEVERINI, G. Una batteriosi dell'*Ixia maculata* e del *Gladiolus Colvillii*. – *Annal*
Botanica, Vol. XI, Part 3, pp. 412-422, plate VIII. Rome, 1913.

In April 1912, the writer observed a soft rot on bulbs of *Ixia macul*
and *Gladiolus Colvillii* resembling a bacterial disease. All the plants (fr
bulbs obtained from Holland), though grown in quite separate locali
showed signs of the disease simultaneously, at the time of appearance of
first blooms.

The symptoms of attack begin with a yellowing of the tips of the le
extending longitudinally to the base, and finally the whole leaf turns yel
Livid purple spots then appear, quite distinct at first, but later chan
into a greyish black mass. The whole shoot is easily detached from
bulb, and may fall to the ground of itself. On superficial examination,
bulb appears normal, but within the outer sheath it is covered with ye
or reddish spots and is found to be flaccid and full of a soft granular m
The disease attacks young bulbs equally with the old ones.

The writer has obtained pure cultures of the organisms present in
diseased tissue, and out of five bacteria which he isolated he found
three were capable of producing the disease by artificial infection.
of these organisms occurred on *Gladiolus* and the two others proved to
one species capable of producing the disease in either *Gladiolus* or *Ixia*.
organism from *Gladiolus* he named *Pseudomonas Gladioli* and the one c
mon to both *Bacillus Ixiae*.

The above organisms are capable of producing " soft rot " of the b
and leaf sheaths. They are confined to the intercellular spaces of
parenchyma, where, by dissolving the median lamellae they produce a c
plete separation of the cells. They do not alter the cellulose walls or the sta
grains, but the protoplasm is soon poisoned. *Bacillus Ixiae* appears
attack the pectic matter of the median lamellae more vigorously, w
Pseudomonas Gladioli exerts a greater toxicity towards the protopla

(2) See also No 316, *B.* Jan. 1911, and No. 616, *B.* Feb. 1911.

The writer also found that both organisms can produce the disease in plants, but that the power of adaptation is less with *Bacillus Ixiae.* Infection, under natural conditions, probably takes place through ase of the bulbs, where the micro-organisms can readily gain entrance. conditions necessary for the progress of the disease are a temperature to 30°C. and great humidity.

As preventive measures the winter recommends: *a*) using only bulbs uninfected districts and storing them in a dry airy place; *b*) disin- of the bulbs by plunging for 15 minutes in warm water at a tempera- f 50° to 55°C. (122° to 130°F.); this does not hurt them, while the organ- re killed at 47°C. (117°F.); *c*) mould and pots that have been near ed plants should be discarded and the frame disinfected with formol or of lime; *d*) the plants must have a free circulation of fresh air, plenty ht, and not too much moisture.

- **Dik-voet, Club-root, or Finger-and-toe (*Plasmodiophora Brassicae,* Woronin) in South Africa.** — POLE EVANS, I. B. in *The Agricultural Journal of e Union of South Africa,* Vol. VI, No. 1, pp. 93-97, plates V-VII. Pretoria, July 1913.

his is the first report of the occurrence of this disease in South Africa, it has undoubtedly existed durng the past 10 or 15 years. The of the present outbreak in the Cape Province emphasises the im- ce of greater vigilance on the part of the farmers and of a more ready ration between the cultivator and scientific expert in the control of iiseases.

p to the present it has not been observed as occurring on turnips th Africa, though this is the crop most frequently attacked in England. articular outbreak appears to be nearly confined to cabbages and owers.

he writer describes the characters of the disease and the usual pre- e measures.

- **"Ferrugem da pimenteira" (*Puccinia Capsici* n. sp.) on Various ecies of Capsicum in the State of Sao Paulo, Brazil.** — AVERNA-SACCA, SARIO. — Ferrugem da pimenteira, Puccinia Capsici n. esp. — *O Fazendeiro,* VI, No. VII, pp. 258-259, 2 figs. S. Paulo, July 1913.

uccinia *Capsici* n. sp., which appeared for the first time in 1909, is serious pest of capsicums in various parts of the State of Sao Paulo types of soil; plants in damp and shady situations are, however, most tible to the disease. Up to the present it has been recorded on *C.* rum (pimenta da China), *C. frutescens* (pimenta cumarim), *C. pendu-* imenta malagueta), and *C. microcarpum* (pimenta cumarim miuda), ot yet on *C. grossum* (pimentões); it is probable, however, that atter is equally susceptible, because hardier and consequently resistant varieties like those above mentioned are not immune e disease.

his fungus attacks all parts of the plant; on the stalks and branches of l years' growth it produces fruiting pustules, resulting in lesions and trophy of the parts affected. The terminal buds are attacked most

severely and become deformed and shrivelled. The leaves become cover with distinct spots, corresponding to fruiting bodies on the under sid they soon curl up and eventually wither. The flowers are also attacke particularly on the peduncle and calyx; attacks on the peduncles occas loss of fruit.

1217 – **A Die-back Disease of Douglas Fir produced by a Variety of Spha *opsis Ellisii*.** — PETRI, L. in *Annales Mycologici*, Vol. XI, No. 3, pp. 178, figs. 1-3. Berlin, 1913.

In the spring of 1912, a large number of Douglas firs, which had b planted 5 to 7 years ago in fresh sandy soil protected by a covert Scots pine at Grezzano nel Mugello (Tuscany), at 1000 ft. above sea-le showed a drying up of the tips of the branches. This drying up of the br ches ended abruptly a short distance from the summit of the tree and at point of separation between the dead twigs and the part still green a m lium could be detected, which spread into the cortical tissues. W kept in a moist chamber, pycnidia developed and the fungus was ident as a variety of *Sphaeropsis Ellisii* Sacc., a species of fungus having n distinct forms identified by the host plant rather than by morpholo characters.

The variety on *Pseudotsuga* differs slightly from the known vari of *Sph. Ellisii* in the dimensions of its spores, and approaches neare the variety *Abietis*.

The writer has not yet obtained the germination of the spores i tritive media.

The chief cause of the outbreak appears to be attributable to the tion of the trees attacked; in spite of the south aspect, they have no ficient light, and grow in an excessively moist atmosphere. At a dis of 50 yards, on the same soil, there are thousands of Douglas firs of the age, but not shadowed by any other trees, and all are perfectly he

Although direct observation has not yet been made, it is possible the infection of the Douglas firs took place with spores of *Sphae* from the branches and cones of the *Pinus sylvestris*, and that the f developed on the young trees owing to the special conditions of hur and temperature.

Successful experiments to prevent infection have been carried o spraying with a 1 per cent. mixture of lime and copper sulphate.

PARASITIC AND OTHER INJURIOUS FLOWERING PL

1218 – ***Avena fatua* and other Species of *Avena*, with their Hybr Weeds of Cereal Crops in France in 1913.** — RABATÉ, E. La folle av *Le Progrès Agricole et Viticole*, Year 33, No. 32, pp. 116-180, figs. 1-5. Mo August 10, 1913.

Avena fatua (the wild oat), with other wild annual species of (*A. barbata*, *A. strigosa*, *A. sterilis*, *A. Ludoviciana*) and hybrids b these and *A. sativa* (the cultivated oat) — all known in France as

e" and common weeds of grain crops in the south-west and south of untry — has been very prevalent in the crops this season, after a mild r and rainy spring.

The losses to farmers have been very considerable. In some fields rain had to be cut green in early June to prevent the wild oat seeds shed.

From his own observations on some fifty farms, and from reports re-d, the writer considers that there are good botanical characters for guishing the seeds of *A. sativa* from those of the weed species, but the r becomes hopeless for certain hybrids which are very close to the cul-d oats.

Severe winters destroy the weed species in large quantities.

The deep ploughings of 1912 favoured the great invasion of 1913. After deep work it is well to take either a spring root crop or a market-n crop before cereals, as such a crop allows the wild oats to come up undance, and they soon get destroyed by the repeated hoeings.

Ploughing the stubble after a very foul crop of wheat only induces the ination of quite a few seeds of wild oats; the majority remain dormant e soil for many years. Summer ploughing on over-dry land favours evelopment of wild oats in the grain crop following. On badly infested oats, wheat and red clover ("trèfle violet de Hollande") must not be n for several years; on such land smothering crops, such as rye, lu-, temporary leys, rape and mustard, should alternate with well tilled crops and green crops cut before the wild oats flower. On such land t cannot do better than after two cleaning crops in succession, either a l crop and a root crop, or two root crops.

Commercial oats containing grains of hybrids of weed species with *va* should be crushed before feeding to stock.

or control measures the writer advises: hand-hoeing in February or ; horse-hoeing of cereals in drills in February, followed by spraying 0 per cent. sulphuric acid; pulling up of tufts in April and May; of the ears in early June; cutting green followed by ploughing; ction of chaff which may contain wild oats; and lastly firing the

INSECT PESTS.

***Leucopis nigricornis*, a Natural Enemy of *Pulvinaria camelicola*.** — MALENOTTI, ETTORE. Sopra un nemico naturale della "Pulvinaria camelicola" Sign. — "*Redia*", Vol. IX, Part I, pp. 113-155. Florence, August 28, 1913.

Some specimens of ***Pulvinaria camelicola*** collected at Ascoli Piceno on the leaves of orange trees and forwarded to the Royal Station Agricultural Entomology at Florence, were found to have deformed ovi-and the writer discovered this to be due to the presence of dipterous feeding on the eggs. The writer reared these parasites early in June identified the fly as being *Leucopis nigricornis*, a species already re-

corded as a parasite of insects in Hawaii and the United States, but which not very common and of whose habits little is known. It appeared tha in Italy at least, *Leucopis* had not before been recorded as a parasite *Pulvinaria camelicola*.

1220 – ***Aelia acuminata*, a Hemipterous Pest of Cereals in Algeria.** — Vuillet P. Un ennemi de plus des céréales. — *Revue Agricole et Viticole de l'Afrique du N (Algérie-Tunisie-Maroc)*, Vol. II, No. 71, pp. 644-646. Algiers, July 19, 1913.

During May and June, the grain crops (wheat and barley) in seve districts of Algeria were reported to be attacked by an insect which pier the soft unripe grains and caused them to dry and shrivel up in the ear. writer identified the insect as *Aelia acuminata* (Hemiptera), which occ normally on uncultivated land, but which in certain seasons multiplies v rapidly and seeks food in neighbouring cornfields.

The writer recommends sowing the corn in separate strips so tha workman can pass between and collect the insects in a butterfly net. this way many insect pests can be collected and destroyed by burning. T gatherings at intervals of 8 or 10 days are generally sufficient to remove bulk of the insects. The cost of collecting and burning the insects amou to only about 4*d* an acre.

1221 – ***Heterodera radicicola* on the Roots of *Scirpus sylvaticus* Silesia.** — OBERSTEIN, O. Eine neue Älchengalle an den Wurzeln der Wald (Scirpus silvaticus L.). — *Zeitschrift für Pflanzenkrankheiten*, Vol. XXIII, Pa pp. 262-264, figs. 1-2. Stuttgart, August 20, 1913.

In the spring of this year, Dr. A. Lingelsheim found nodular and fi form swellings on the roots (chiefly the lateral ones) of *Scirpus sylvati* growing in the Botanical Gardens at Breslau. It was found that th swellings were due to the presence of *Heterodera radicicola* Greeff. T discovery is interesting because gall-like formations have not before b recorded on the genus *Scirpus*, and also because *S. sylvaticus* is a new pl host of this widely spread nematode.

1222 – **The Hop Aphis in the Pacific Region.** — PARKER, Wm B. — *United S Department of Agriculture, Bureau of Entomology, Bulletin* No. 111, pp. 43 + figs. plates. Washington, May 1913.

The hop aphis (*Phorodon humuli*), known as a pest in Europe long fore hop growing became an industry in America, is now a troublesom pest in most of the hop-growing sections of British Columbia, Washingt Oregon and California.

The writer gives the results of his observations and experiments made Sacramento and Santa Rosa (California). From a series of observati on the biology of the insect and its relations to its host-plants (hop, pl cherry, peach, apple), he describes the life history as follows.

Two generations are produced on the hibernating host plant, the seco of which is winged; five or six generations occur on the hop; some of fifth generation are winged and give rise to the hibernating generati whilst others remain wingless and give rise to a sixth generation of wi

ment	Materials used	Pressure	Percentage killed.	Cost per 100 gals.
		lbs.		
	Nicotine sulphate 1 in 3 000	80–100	99.9	$0.416
	Nicotine sulphate 1 in 3 000; with whale-oil soap, 4 in 100	80–100	99,2	0.80
	Nicotine sulphate 1 in 3 000; with cresol soap, 1 in 300	80–100	95	0.83
	Tobacco waste, 25 lbs. to 100 gallons water	100	100	0.18
	Quassia 9 lbs., whale-oil soap 6 lbs., water 100 gallons	—	—	0.74

s on the hop; these winged males of the sixth generation follow the ed females of the fifth generation, which produce eggs and give rise ie first generation the following spring. The eggs are laid on leaf or leaf scars.

The aphides live chiefly on the under side of the leaves and are only found on the upper surface during a bad attack; later they migrate ie hop cones. The spread of the attack is facilitated by ants (*Formica rnicea* Say), which cultivate them for the honey-dew and carry them ie young shoots for fresh feeding grounds.

Damage to the hop plants is brought about in two ways: 1) by sucking nices of the plant, and 2) by the growth of a black smut (*Cladosporium* in the sugary secretion, which deteriorates the value of the harvest, 1 rendering it worthless.

Amongst the natural enemies of the hop aphis are the following: *podamia convergens* Guér., *Coccinella californica* Mannh., *C. abdominalis* *Chilocorus orbus* Cas., *Chrysopa californica* Coq., *Syrphus opinator* ., *S. americanus* Wied., *Triphleps insidiosus* Say, *Adalia bipunctata* L., *lorus punctum* Lec., *Camptobrochis nebulosus* Uhl., *Anthocoris* sp. In t of these enemies the spread of hop aphis has never been adequately ked and contact sprays are generally adopted, especially decoctions of ieco or quassia and whale-oil soap.

Spraying should take place in the springtime as soon as the aphides ear on the plum or other fruit tree, then again in the autumn to reduce attack on the hops. Twice to four times is necessary in the autumn eep down the numbers of the aphides, and each time the greatest care t be taken to reach both sides of the leaves. Very careful spraying e has been known to save the crop from serious attacks.

Details are given of several experiments made with different insecti- s and of the technique of spraying. Flour paste is specially recom-

mended in place of soap as being cheaper and quite inoffensive. It is made by mixing a cheap flour with cold water until a smooth thin butter is obtained. This is diluted until it contains 1lb. of flour to each gallon of water and is then cooked to a paste, sufficient water being added to make up for evaporation; when mixed with the insecticide the flour paste has a tendency to settle, so that constant agitation is necessary.

The table on the preceding page gives the most important mixtures for use with a compressed air sprayer.

From 300 to 500 gallons per acre are required and one machine will spray from 2 to 3 acres per day. The total cost of spraying 500 gals. per day of the nicotine sulphate flour-paste mixture amounts to $6.79 per acre whilst the quassia and whale-oil soap mixture amounts to $7.25 per acre. Stripping the vines before spraying will cost from $1.80 to $2 per acre.

A bibliography of 34 works is appended.

1223 – ***Aphrophora spumaria* on Roses and Pinks.** — MOLINAS, E. L'*Aphrophora spumaria* sur les œillets d'Antibes. — *Journal d'Agriculture pratique*, 1913, Vol. I No 31, p. 155. Paris, July 31, 1913.

Roses and pinks have been attacked this year at Antibes by the larvae of *Aphrophora spumaria* (Hemiptera), which reduced the foliage and caused the young shoots to turn yellow. As a rule the damage due to this insect is slight because the larvae appear only in small numbers and towards the end of the season. The ravages of this pest are kept in check by hand picking and dusting the plants with quick lime.

1224 – **Painted Lady Caterpillars damaging Artichokes in France.** — TSCHAHS, Un parasite de l'artichaut. — *Le Progrès Agricole et Viticole* (*Edition de l'Est-Central*), Year 34, No. 29, pp. 88-89, figs. 1-2. Montpellier, July 20, 1913.

The caterpillars of the Painted Lady (*Pyrameis cardui*), which is generally to be found on thistles and mallow in France, occasionally appears in artichoke beds, but its numbers are generally too small for it to be considered as a serious pest.

However, in the spring of 1913, large artichoke beds in the neighbourhood of Hyères were entirely destroyed in a few days by these caterpillars, which then invaded neighbouring plants, including a bed of French beans. Several insecticides were tried, but with little success. The writer suggests that the egg-laying should be carefully watched towards the end of April, and a suitable insecticide used to drive away the butterflies.

1225 – ***Nysius senecionis* Attacking Recently Planted Vines** (1). — PICARD in *Le Progrès Agricole et Viticole*, Year 30, No. 30, p. 101. Montpellier, July 27, 1913.

This noxious insect (Hemiptera) is very abundant this year on young grafts in many localities in France. The writer recommends the treatment previously mentioned as being the most effective.

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(1) See No. 1484, *B.* Oct. 1912.

- **Some Animal Parasites on *Prunus* in Provence.** — COTTE, J. in *Journal d'Agriculture pratique*, Vol. II, No. 34, pp. 243-244. Paris, August 21, 1913.

The writer has been studying the animal parasites deforming plants rovence during the last two years and describes those which he has rved recently on *Prunus domestica* and *P. spinosa*.

Amongst parasites attacking the leaves (already recorded in other pean countries) he mentions: a) *Eriophyes similis*, not widely spread causing little damage; treatment consists of severe pruning and re- al of the leaves attacked later by the parasite: it is also kept in k by numerous enemies. b) *Aphis cerasi*, the commonest aphis on plums rovence. c) *Myzus pruni-mahaleb*, occurs everywhere. d) *Hyalop- pruni*. e) *Perrisia tortrix*, not frequent.

As a parasite on buds the writer cites another Cecidomyiid, *Asphon- a prunorum*, which, though long known, has been little studied. It ly occurs on plums, but is common on blackthorn, and the writer re- mends the destruction of all blackthorn bushes infested with this pest he neighboorhod of plum orchards, or at any rate their treatment with itable insecticide.

- ***Melitomma insulare* and *Rhina nigra*, Beetles Injurious to Cocoanuts in Madagascar.** — VUILLET, A. Deux ennemis du Cocotier de la région Malgache. — *L'Agronomie Coloniale*, Year 1, No. 2. pp. 33-37, 1 plate. Paris, August 31, 1913.

The writer describes the life history of *Melitomma insulare* Fairm., its its and means of combatting it. (1). It occurs in the Seychelles and in island of Berafia (north-west of Madagascar), where it causes serious nage to coconut plantations; it is probably distributed throughout the dagascar region.

Rhina nigra Drury also occurs in Madagascar, as well as Berafia, where as given much trouble. This beetle has been observed to attack trees larly at a height of 5 feet, though they were already damaged at their by *Melitomma* beetles. These observations do not agree with those W. Urich concerning *Rhina barbirostris* (2). The eggs are laid in a ll cavity of the bark made by the female and the larvae very soon trate into the hardest portions of the wood where they bore numer- galleries.

Preventive measures are adopted against this parasite by covering all nds in the bark with coal-tar, and using a mixture of thick lime wash lead arsenate (1 lb. of lead arsenate in 10 gals. lime wash) to destroy eggs laid on the tree trunks. At Berafia the eggs are destroyed by ping the bark and the application of coal-tar. Trapping the insects placing sections of decaying stumps in the plantations to attract the ile females, and destruction of the larvae by boiling water, might be d with advantage.

(1) See No. 2005, *B.* June 1911.
(2) See No. 1698, *B.* Dec. 1912.

1228 – **Insect Injourious to Papaw Apples: *Dichocrocis punctiferalis*.**
JARVIS., E. in *The Queensland Agricultural Journal*, Vol. XXXI, Part I, pp. 33-3
Brisbane, July 1913.

A disease of papaya trees was reported from Cleveland in May, and w
found to be due to a well-known insect pest, *Dichocrocis punctiferal*
Though primarily a maize pest, this insect appears to be extending
ravages to fruit trees, reports having already been received of its damag
custard apples, oranges, peaches, loquats, cotton and other fruits and see
The infested trees had their top leaves drooping or dead, their main ste
defoliated, with small discoloured fruits hanging from the blackened crow

The full-grown moth measures about an inch across the expand
wings, which are pale orange-yellow with numerous dots. It appears o
at night and lays its eggs on the base of the leaf stalk or occasionally
the fruits. The larvae penetrate the stalk and bore their way to the cro
where they pupate. A full-grown larva is nearly an inch long, dirty wh
in colour, and marked with rows of grey spots. Its head is dark brown
the first segment of a lighter brown colour. It pupates in a loose silken
on the exterior of the crown of the tree.

The following preventive measures are recommended: 1) Spray
with arsenate of lead (1 lb. to 50 gallons of water) in the form of a mist
spray. This is directed principally against early broods and should be
plied early. All trees, profitable or unprofitable, that are liable to be attac
in the neighbourhood should be sprayed. 2) Maize grown as a t
crop and destroyed immediately the grubs are approaching full size. 3)
struction of all infested fruit, such as peaches, etc. 4) Avoid plan
maize, except as a trap-crop, near orchards.

1129 – **Deformation of the Flowers of *Fraxinus Ornus* caused by *Eriop*
fraxini.** — SIRENA, CORLEO SIMONE. Alcune deformazioni del *Fraxinus Orn*
Malpighia, Year XXX, Part V-VI, pp. 512-517. Catania, 1913.

The author has observed certain peculiar gall-like formations o
flowering branches of *Fraxinus Ornus* growing near Palermo.
growths appear here and there on long or more frequently short stall
irregular shaped masses, somewhat flattened and lobed, of a reddish-b
colour, turgid and more or less glandular. According to the writer
represent floral axes, the numerous protuberances of which are small gro
deformed and aborted flowers surrounded by the rudimentary floral or
In some of them a small circular depression is noticeable in the centre,
sponding, perhaps, to the receptacle, but no trace of the pistil is discer

These malformations are caused by an acarine pest, *Eriophyes fr*
more commonly known as a parasite of the common ash (*F. exce*

The writer has observed that these aborted floral receptacles sec
sugary liquid which is devoured by ants. This is remarkable, sinc
flowers of *F. Ornus* do not normally secrete nectar; it may be acco
for by the great quantity of sugar occurring in the sap, especially in sum
Owing to the excessive turgesence of the swellings produced b
insect this sweetish secretion is exuded. It seems to be the first
of secretions from acarid galls.

ALFREDO RUGGERI, *gerente responsabile.*